



**Thecus 1U4500R
1U4500S**

User's Manual

Copyright and Trademark Notice

Thecus and other names of Thecus products are registered trademarks of Thecus Technology Corp. Microsoft, Windows, and the Windows logo are registered trademarks of Microsoft Corporation. Apple, iTunes and Apple OS X are registered trademarks of Apple Computers, Inc. All other trademarks and brand names are the property of their respective owners. Specifications are subject to change without notice.

Copyright © 2007 Thecus Technology Corporation. All rights reserved.

About This Manual

All information in this manual has been carefully verified to ensure its correctness. In case of an error, please provide us with your feedback. Thecus Technology Corporation reserves the right to modify the contents of this manual without notice.

Product name: Thecus 1U4500

Manual Version: 1.0

Release Date: January 2007

Limited Warranty

Thecus Technology Corporation guarantees all components of Thecus 1U4500 are thoroughly tested before they leave the factory and should function normally under general usage. In case of any system malfunctions, Thecus Technology Corporation and its local representatives and dealers are responsible for repair without cost to the customer if the product fails within the warranty period and under normal usage. Thecus Technology Corporation is not responsible for any damage or loss of data deemed to be caused by its products. It is highly recommended that users conduct necessary back-up practices.

Safety Warnings

For your safety, please read and follow the following safety warnings:













-  Read this manual thoroughly before attempting to set up your 1U4500.
-  Your 1U4500 is a complicated electronic device. DO NOT attempt to repair it under any circumstances. In the case of malfunction, turn off the power immediately and have it repaired at a qualified service center. Contact your vendor for details.
-  DO NOT allow anything to rest on the power cord and DO NOT place the power cord in an area where it can be stepped on. Carefully place connecting cables to avoid stepping or tripping on them.
-  Your 1U4500 can operate normally under temperatures between 0°C and 40°C, with relative humidity of 20% – 85%. Using the 1U4500 under extreme environmental conditions could damage the unit.
-  Ensure that the 1U4500 is provided with the correct supply voltage (AC 100V ~ 240V, 50/60 Hz, 3A). Plugging the 1U4500 to an incorrect power source could damage the unit.
-  Do NOT expose the 1U4500 to dampness, dust, or corrosive liquids.
-  Do NOT place the 1U4500 on any uneven surfaces.
-  DO NOT place the 1U4500 in direct sunlight or expose it to other heat sources.
-  DO NOT use chemicals or aerosols to clean the 1U4500. Unplug the power cord and all connected cables before cleaning.
-  DO NOT place any objects on the 1U4500 or obstruct its ventilation slots to avoid overheating the unit.
-  Keep packaging out of the reach of children.
-  If disposing of the device, please follow your local regulations for the safe disposal of electronic products to protect the environment.

Table of Contents

Copyright and Trademark Notice	2
About This Manual	2
Limited Warranty.....	2
Safety Warnings	3
Table of Contents	4
Chapter 1: Introduction.....	7
Overview	7
Product Highlights.....	7
File Server.....	7
FTP Server.....	7
Backup Server	7
Printer Server	7
Redundant Power Supply (1U4500R)	8
Package Contents	8
Front Panel.....	8
Hard Disk Trays.....	9
Rear Panel.....	9
1U4500R.....	9
1U4500S.....	9
Chapter 2: Hardware Installation	10
Overview	10
Before You Begin.....	10
Hard Disk Installation	10
Cable Connections	10
Checking System Status	11
System Status Normal.....	11
System Trouble	12
Chapter 3: First Time Setup	13
Overview	13
Thecus Setup Wizard	13
LCD Operation	15
LCD Controls.....	15
Display Mode	15
USB Copy.....	16
Management Mode	16
Typical Setup Procedure.....	16
Step 1: Network Setup.....	16
Step 2: RAID Creation.....	17
Step 3: Create Local Users or Setup Authentication	17
Step 4: Create Folders and Set Up ACLs	17
Step 5: Start Services	17
Chapter 4: System Management	18
Overview	18
Web Administration Interface	18
Menu Bar	18
Language Selection	19
Status Menu	20
Product Information	20
System/Service Status	20
System Information	21
Printer Status.....	21
Storage Management	22

Disks Information	22
S.M.A.R.T. Information	23
RAID Information	23
RAID Configuration	24
RAID Level	24
Disk Settings	25
Creating a RAID	25
Deleting a RAID	26
Advanced RAID Configuration	26
Folder Management	27
Adding Folders	27
Editing Folders	28
Deleting Folders	28
NFS Share	28
Folder Access Control List (ACL)	29
System Snapshots	30
Network Management	30
WAN Configuration	30
LAN Configuration	31
DHCP Configuration	32
Web Services Configuration	32
AFP (Apple Network Setup)	33
NFS Setup	33
User and Group Management	34
Local User Configuration	34
Adding Users	34
Modifying Users	35
Deleting Users	35
Local Groups Configuration	35
Adding Groups	36
Modifying Groups	36
Deleting Groups	36
ADS/NT Configuration	36
System Management	37
System Notifications	37
System Logs	38
Time and Date Settings	39
System Configuration Backup and Restore	39
Reset to Factory Default Settings	40
Upgrading System Firmware	40
Change Administrator Password	41
Reboot and Shutdown System	41
Logout	41
Chapter 5: Additional Feature Setup	42
Overview	42
FTP Server	42
Printer Server	43
Windows XP SP2	43
Windows Vista	44
Chapter 6: Using the 1U4500	47
Overview	47
Login Page	47
Using WebDisk	47
Mapping a Client PC to the 1U4500	48
Windows	48
Apple OS X	48
File Backup	49
Nsync	49

Adding an Nsync Task	49
Setting Up an Nsync Target on an Nsync Device.....	50
Setting Up an Nsync Target on Another Device	50
Designating 1U4500 as an Nsync Target	50
Thecus Backup Utility	51
Windows XP Data Backup	52
Apple OS X Backup Utilities	52
Chapter 7: Tips and Tricks	53
USB and eSATA Storage Expansion.....	53
Adding a Spare Disk	53
Target USB	53
Remote Administration.....	54
Part I - Setup a DynDNS Account	54
Part II - Enable DDNS on the Router	54
Part III - Setting up Virtual Servers (HTTPS)	54
Firewall Software Configuration	55
Replacing Damaged Hard Drives	55
Hard Drive Damage	55
Replacing a Hard Drive.....	55
RAID Auto-Rebuild.....	55
Replacing a Failed Power Supply (1U4500R).....	56
Chapter 8: Troubleshooting	57
Forgot My Password	57
Forgot My Network IP Address.....	57
Resetting NAS IP Address and Admin Password.....	57
Can't Map a Network Drive in Windows XP.....	57
Restoring Factory Defaults	58
Problems with Time and Date Settings.....	58
Appendix A: Product Specifications	59
Hardware Specifications.....	59
Software Specifications	60
Appendix B: Customer Support.....	61
Appendix C: RAID Basics	62
Overview	62
Benefits	62
Improved Performance	62
Data Security.....	62
RAID Levels.....	62
RAID 0.....	62
RAID 1.....	63
RAID 5.....	63
RAID 6.....	63
RAID 10	63
JBOD	63
Stripe Size	63
Disk Usage	64
Appendix D: Active Directory Basics	65
Overview	65
What is Active Directory?	65
ADS Benefits.....	65
Appendix E: Licensing Information.....	66
Overview	66
Source Code Availability	66
CGIC License Terms.....	67
GNU General Public License.....	67

Chapter 1: Introduction

Overview

Thank you for choosing the Thecus 1U4500 1U Rackmount Storage Server. The Thecus 1U4500 is an easy-to-use storage server that allows a dedicated approach to storing and distributing data on a network. Data reliability is ensured with RAID features that provide data security and recovery—over one Terabyte of storage is available using RAID 5 and RAID 6. Gigabit Ethernet ports enhance network efficiency, allowing the 1U4500 to take over file management functions, increase application and data sharing and provide faster data response. The 1U4500 offers data mobility with a disk roaming feature that lets you hot swap working hard drives for use in another 1U4500, securing the continuity of data in the event of hardware failure. The 1U4500 allows data consolidation and sharing between Windows (SMB/CIFS), UNIX/Linux, and Apple OS X environments, and its user-friendly GUI supports multiple languages. Take the time now to read through this user's manual and get the most out of your 1U4500.

Product Highlights

File Server

First and foremost, the 1U4500 allows you to store and share files over an IP network. With a Network Attached Storage (NAS) device, you can centralize your files and share them easily over your network. With the easy-to-use web-based interface, users on your network can access these files in a snap.

To learn about the Web User Interface, go to **Chapter 6: Using the 1U4500 > Using WebDisk**.

FTP Server

With the built-in FTP Server, friends, clients, and customers can upload and download files to your 1U4500 over the Internet with their favorite FTP programs. You can create user accounts so that only authorized users have access.

To set up the FTP Server, refer to **Chapter 5: Additional Feature Setup > FTP Server**.

Backup Server

Don't leave precious data to chance. With advanced backup capabilities, you can easily upload mission critical files to the 1U4500, and even automate your backup tasks for true peace-of-mind.

To find out how to backup your files with the 1U4500, refer to **Chapter 6: Using the 1U4500 > File Backup**.

Printer Server

With the 1U4500's Printer Server, you can easily share an IPP printer with other PCs connected to your network.

To set up the Printer Server, refer to **Chapter 5: Additional Feature Setup > Printer Server**.

Redundant Power Supply (1U4500R)

The redundant power supply included with the 1U4500R ensures maximum uptime in the event of a failure of one of the power supplies. This is recommended for systems that require a high degree of fault tolerance.

Package Contents

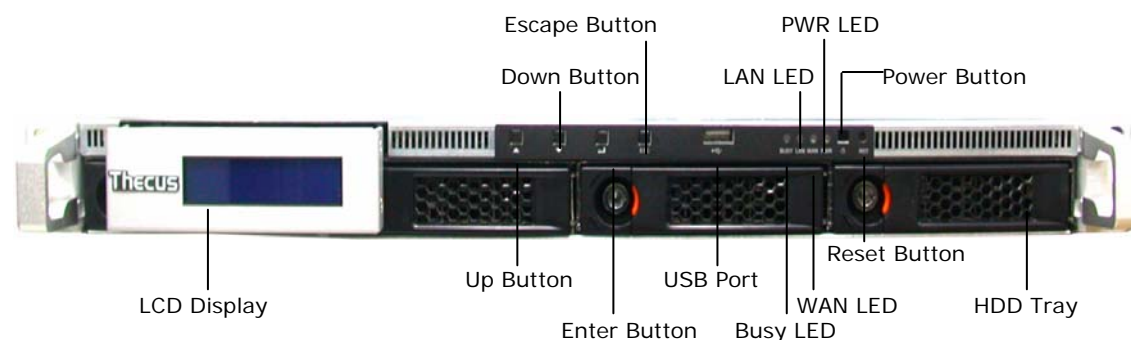
Your 1U4500 package should contain the following items:

- QIG
- CD-Title
- Ethernet Cable
- USB2.0 Cable Accessory
- Screw Kit

Please check to see if your package is complete. If you find that some items are missing, contact your dealer.

Front Panel

The 1U4500's front panel displays the unit's array of status LEDs, controls, USB port, and LCD display. See the table below for a detailed explanation of each:



Front Panel	
Item	Description
WAN LED	<ul style="list-style-type: none">• Solid green: network link• Blinking green: network activity
LAN LED	<ul style="list-style-type: none">• Solid green: network link• Blinking green: network activity
Busy LED	<ul style="list-style-type: none">• Blinking orange: system startup or system maintenance; data currently inaccessible
USB Port	<ul style="list-style-type: none">• USB 2.0 port for compatible USB devices, such as digital cameras, USB disks, and USB printers
Power Button	<ul style="list-style-type: none">• Power on/off 1U4500• Solid blue: Device is powered on• Blinking blue: eSATA hard disk is connected and active
Reset Button	<ul style="list-style-type: none">• Resets the 1U4500• Press for five seconds during boot process to reset IP address and admin password
HDD Trays	<ul style="list-style-type: none">• Four 3.5" SATA HDD trays• Locks are provided for added security
LCD Display	<ul style="list-style-type: none">• Displays current system status and warning messages• Displays hostname, WAN/LAN IP address, RAID status, and current time
Up Button ▲	<ul style="list-style-type: none">• Push to scroll up when using the LCD display
Down Button ▼	<ul style="list-style-type: none">• Push to scroll down when using the LCD display
Enter Button ↵	<ul style="list-style-type: none">• Push to confirm information entered into the LCD display
Escape Button ESC	<ul style="list-style-type: none">• Push to leave the current LCD menu

Hard Disk Trays

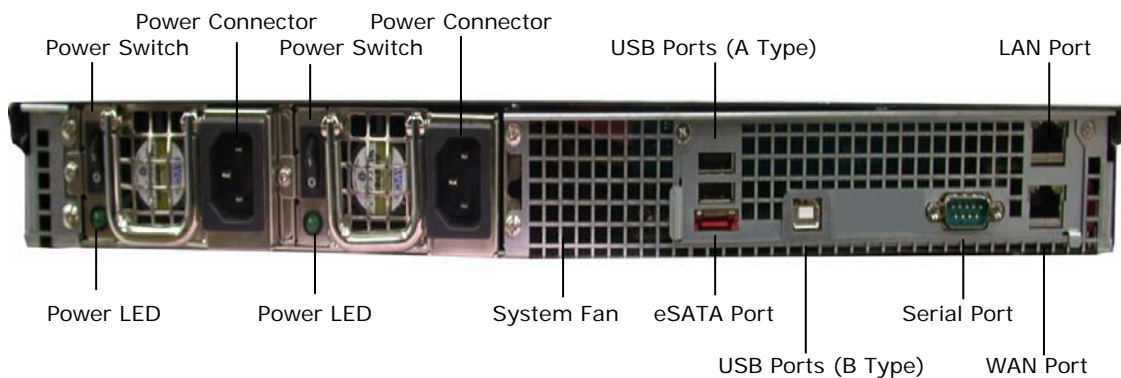
Each of the 1U4500's hard disk trays has a lock, a latch, and two LED indicators:

Hard Disk Trays	
Item	Description
Lock	• Use the lock to physically secure the hard disk to the unit
Latch	• Use to open and remove or close and secure the tray
HDD Power LED	• Solid blue: hard disk is powered on
HDD Access/Error LED	• Blinking green: system is accessing data on the hard disk • Blinking red: a hard disk error has occurred

Rear Panel

1U4500R

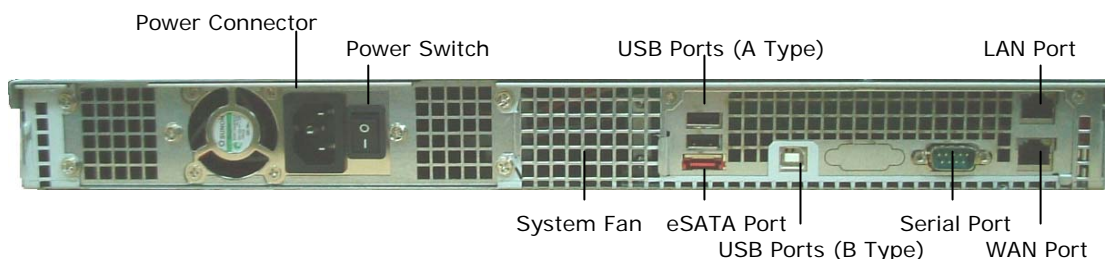
The rear panel of the 1U4500R houses most of the USB and Ethernet connections, as well as the eSATA port, system fan, and power connector. See the table below for descriptions of each:



1U4500 Back Panel	
Item	Description
eSATA Port	• eSATA port for high-speed storage expansion
USB Ports	• USB 2.0 ports for compatible USB devices, such as digital cameras, USB disks, and USB printers
WAN Port	• WAN port for connecting to an Ethernet network through a switch or router
LAN Port	• LAN port that can be used for connection sharing
Power Switch	• Switch for power supply
System Fan	• System fan that exhausts heat from the unit
Serial Port	• This port is for factory use only
Power Connector s	• Connect the included power cords to these connectors

1U4500S

The rear panel of the 1U4500S is similar to the 1U4500R, but with a single power connector:



Chapter 2: Hardware Installation

Overview

Your 1U4500 is designed for easy installation. To help you get started, the following chapter will help you quickly get your 1U4500 up and running. Please read it carefully to prevent damaging your unit during installation.

Before You Begin

Before you begin, be sure to take the following precautions:

1. Read and understand the **Safety Warnings** outlined in the beginning of the manual.
2. If possible, wear an anti-static wrist strap during installation to prevent static discharge from damaging the sensitive electronic components on the 1U4500.
3. Be careful not to use magnetized screwdrivers around the 1U4500's electronic components.

Hard Disk Installation

The 1U4500 supports four standard 3.5" Serial ATA (SATA) hard disks. To install a hard disk into the 1U4500, follow the steps below:

1. Remove a hard disk tray from the 1U4500.
2. Slide the new SATA hard disk into the tray and fasten the screws.
3. Insert the hard disk and tray back into the 1U4500 until it snaps into place and lock it with a key if desired.
4. The LED blinks green when the hard disk is accessed. If the Error LED flashes red it signals a problem.

NOTE

If your HDD was part of a RAID 1 or 5 array previously, it automatically rebuilds. If you replace all the drives with higher capacity drives, you need to go to Administrator login and format the drives.

Cable Connections

To connect the 1U4500 to your network, follow the steps below:

1. Connect an Ethernet cable from your network to the WAN port on the back panel of the 1U4500.



2. Connect the provided power cord into the universal power socket on the back panel. Plug the other end of the cord into a surge protector socket. Press the power supply switch to turn on the power supply.

NOTE

If you are installing the 1U4500R, be sure to connect both power cables. If you do not, the system will assume one power supply has failed, and an alarm will sound. For more information, refer to Chapter 8: Troubleshooting.



3. Press the power button on the Front Panel to boot up the 1U4500.

Checking System Status

After making connections on the 1U4500 and powering up, check whether the system status is normal or has trouble by observing indicators on the front panel and hard disk trays.

System Status Normal

The system status is normal if:

1. The WAN and LAN LEDs glow green (assuming both are connected).
2. The Power LED on the Front Panel glows blue.
3. The HDD Power LED on each HDD tray glows blue (assuming all disks are installed).
4. The default IP address of the WAN port is 192.168.1.100.

System Trouble

The system has trouble if:

1. System Busy LED glows orange.
2. Any of the HDD Access/Error LED glows red.

If the system has trouble, please refer to [Chapter 8: Troubleshooting](#).

WARNING

There are no user serviceable parts inside the 1U4500. Please contact your distributor for service.

Chapter 3: First Time Setup

Overview

Once the hardware is installed, physically connected to your network, and powered on, you can configure the 1U4500 so that it is accessible to your network users. There are two ways to set up your 1U4500: using the **Thecus Setup Wizard** or the **LCD display**. Follow the steps below for initial software setup.

Thecus Setup Wizard

The handy Thecus Setup Wizard makes configuring 1U4500 a snap. To configure the 1U4500 using the Setup Wizard, perform the following steps:

1. Insert the installation CD into your CD-ROM drive (the host PC must be connected to the network).
2. The Setup Wizard should launch automatically. If not, please browse your CD-ROM drive and double click on **Setup.exe**.



NOTE

For MAC OS X users, double click on Thecus Setup Wizard 1.1.6.dmg

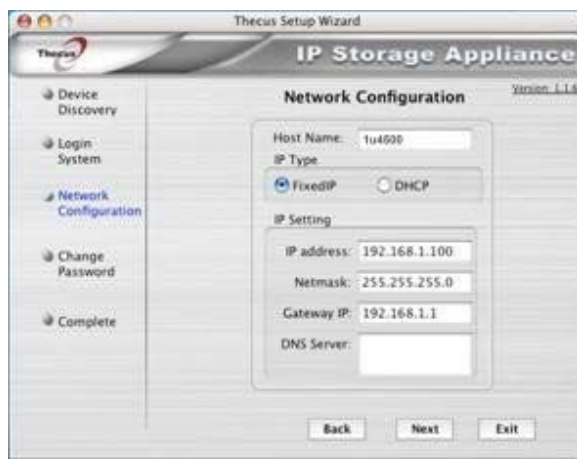
3. The Setup Wizard will start and automatically detect all Thecus storage devices on your network. If none are found, please check your connection and refer to [Chapter 8: Troubleshooting](#) for assistance.



4. Select the 1U4500 that you like to configure.
5. Login with the administrator account and password. The default account and password are both "admin".



6. Name your 1U4500 and configure the network IP address. If your switch or router is configured as a DHCP Server, configuring the 1U4500 to automatically obtain an IP address is recommended. You may also use a static IP address and enter the DNS Server address manually.



7. Change the default administrator password.



8. Finished! Access the 1U4500 Web Administrator Interface by pressing the **Start Browser** button. You can also configure another 1U4500 at this point by clicking the **Setup Other Device** button. Press **Exit** to exit the wizard.



NOTE

The Thecus Setup Wizard is designed for installation on systems running Windows XP/2000 or Mac OSX or later. Users with other operating systems will need to install the Thecus Setup Wizard on a host machine with one of these operating systems before using the unit.

LCD Operation

The 1U4500 is equipped with an LCD on the front for easy status display and setup. There are four buttons on the front panel to control the LCD functions.

LCD Controls

Use the **Up** (▲), **Down** (▼), **Enter** (↵) and **Escape** (ESC) keys to select various configuration settings and menu options for 1U4500 configuration.

The following table illustrates the keys on the front control panel:

LCD Controls

Icon	Function	Description
▲	Up Button	Select the previous configuration settings option.
▼	Down Button	Select the next configuration settings option.
↵	Enter	Enter the selected menu option, sub-menu, or parameter setting.
ESC	Escape	Escape and return to the previous menu.

There are two modes of operation for the LCD: **Display Mode** and **Management Mode**.

Display Mode

During normal operation, the LCD will be in **Display Mode**.

Display Mode	
Item	Description
Host Name	Current host name of the system.
WAN	Current WAN IP setting.
LAN	Current LAN IP setting.
RAID	Current RAID status.
System Fan	Current system fan status.
2006/06/16 12:00	Current system time.

The 1U4500 will rotate these messages every two seconds on the LCD display.

USB Copy

The USB Copy function enables you to copy files stored on USB devices such as USB disks and digital cameras to the 1U4500 with a press of a button. To use USB copy, follow the steps below:

1. Plug your USB device into an available USB port on the Front Panel.
2. In **Display Mode**, press the **Down Button** (▼).
3. The LCD will display “**USB Copy?**”
4. Press **Enter** (↵) and the 1U4500 will start copying USB disks connected to the front USB port.

Management Mode

During setup and configuration, the LCD will be in **Management Mode**.

To enter into Management Mode, press **Enter** (↵) and an “*Enter Password*” prompt will show on the LCD.

At this time, the administrator has to enter the correct LCD password. System will check whether the correct LCD password has been entered. The default LCD password is “0000”. If correct password is entered, you will enter into the **Management Mode** menu.

Management Mode	
Item	Description
WAN Setting	IP address and netmask of your WAN ports.
LAN Setting	IP address and netmask of your LAN ports.
Link Agg. Setting	Select Load Balance or Failover .
Change Admin Passwd	Change administrator's password for LCD operation.
Reset to Default	Reset system to factory defaults.
Exit	Exit Management Mode and return to Display Mode .

NOTE

You can also change your LCD password using the Web Administration Interface by navigating to **System > Administrator Password**. For more on the Web Administration Interface, see **Chapter 4: System Management**.

Typical Setup Procedure

From the Web Administration Interface, you can begin to setup your 1U4500 for use on your network. Setting up the 1U4500 typically follows the five steps outlined below.

For more on how to use the Web Administration Interface, see **Chapter 4: System Management > Web Administration Interface**.

Step 1: Network Setup

From the Web Administration Interface, you can configure the network settings of the 1U4500 for your network. You can access the **Network** menu from the menu bar.

For details on how to configure your network settings, refer to **Chapter 4: System Management > Network Management**.

Step 2: RAID Creation

Next, administrators can configure their preferred RAID setting and build their RAID array. You can access RAID settings from the menu bar of the Web Administration Interface by navigating to **Storage > RAID**.

For more information on configuring RAID, see **Chapter 4: System Management > RAID Configuration**.

Don't know which RAID level to use? Find out more about the different RAID levels from **Appendix C: RAID Basics**.

Step 3: Create Local Users or Setup Authentication

Once the RAID is ready, you can begin to create local users for the 1U4500, or choose to setup authentication protocols such as Active Directory (AD).

For more on managing users, go to **Chapter 4: System Management > User and Group Management**.

For more information on configuring Active Directory, see **Chapter 4: System Management > User and Group Management > ADS/NT Configuration**.

For information about the benefits of Active Directory, see **Appendix D: Active Directory Basics**.

Step 4: Create Folders and Set Up ACLs

Once users are introduced into your network, you can begin to create various folders on the 1U4500 and control user access to each using Folder Access Control Lists.

More information on managing folders, see **Chapter 4: System Management > Folder Management**.

To find out about configuring Folder Access Control Lists, see **Chapter 4: System Management > Folder Management > Folder Access Control List (ACL)**.

Step 5: Start Services

Finally, you can start to setup the different services of the 1U4500 for the users on your network. You can find out more about each of these services by clicking below:

SMB/CIFS

Apple File Protocol (AFP)

Network File System (NFS)

File Transfer Protocol (FTP)

Printer Server

Chapter 4: System Management

Overview

The 1U4500 provides an easily accessible **Web Administration Interface**. With it, you can configure and monitor the 1U4500 anywhere on the network.

Web Administration Interface

Make sure your network is connected to the Internet. To access the 1U4500 **Web Administration Interface**:

1. Type the 1U4500's IP address into your browser. (Default IP address is `http://192.168.1.100`)



NOTE

Your computer's network IP address must be on the same subnet as the 1U4500. If the 1U4500 has default IP address of 192.168.1.100, your managing PC IP address must be 192.168.1.x, where x is a number between 1 and 254, but not 100.

2. Login to the system using the administrator user name and password. The factory defaults are:

User Name: admin

Password: admin

If you changed your password in the setup wizard, use the new password.

Once you are logged in as an administrator, you will see the **Web Administration Interface**. From here, you can configure and monitor virtually every aspect of the 1U4500 from anywhere on the network.

Menu Bar

The **Menu Bar** is where you will find all of the information screens and system settings of the 1U4500. The various settings are placed in the following groups on the menu bar:

Menu Bar	
Item	Description
Status	Current system status of the 1U4500.
Storage	Information and settings for storage devices installed into the

	1U4500.
Network	Information and settings for network connections, as well as various services of the 1U4500.
Accounts	Allows configuration of users and groups.
System	Various 1U4500 system settings and information.
Language	Choose your preferred language here.

Moving your cursor over any of these items will display the dropdown menu selections for each group.

In the following sections, you will find detailed explanations of each function, and how to configure your 1U4500.

Language Selection

The 1U4500 supports multiple languages, including:

- English
- French
- German
- Italian
- Traditional Chinese
- Simplified Chinese
- Japanese
- Korean
- Spanish

On the menu bar, click ***Language*** and the **Change Language** screen appears. This screen allows you to select preferred language for the 1U4500. Press ***Apply*** to confirm your selection.

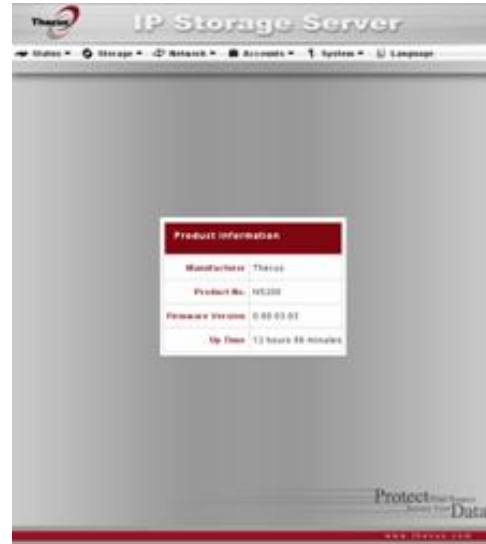


Status Menu

The **Status** Menu on the menu bar allows you to see various aspects of the 1U4500. From here, you can discover the status of the 1U4500, and even find out other details like firmware version and up time.

Product Information

Once you login, you will first see the basic **Product Information** screen providing **Manufacturer**, **Product No.**, **Firmware Version**, and **Up Time** information.



Product Information	
Item	Description
Manufacturer	Displays the name of the system manufacturer.
Product No.	Shows the model number of the system.
Firmware version	Shows the current firmware version.
Up time	Displays the total run time of the system.

To access this screen again, navigate to **Status > About**.

System/Service Status

From the **Status** menu, choose the **System** item, and the **System Status** and **Service Status** screens appear. These screens provide basic system and service status information.



System Status	
Item	Description
CPU Loading (%)	Displays current CPU workload of the 1U4500.

CPU Fan Speed	Displays the current status of the CPU fan.
System Fan Speed	Displays the current status of the system fan.
Memory Size	Shows the system memory capacity.
Up Time	Shows how long the system has been running.

Service Status	
Item	Description
AFP Status	The status of Apple Filing Protocol server.
NFS Status	The status of Network File Service Server.
SMB/CIFS Status	The status of SMB/CIFS server.
FTP Status	The status of FTP server.
Nsync Status	The status of Nsync server.
UPnP Status	The status of UPnP service.

System Information

From **Status** menu, choose the **Info** item, and the **System Information** screen appears. You can change the system information that appears on the Login page by entering the new information here and pressing **Apply** to confirm.



System Information	
Item	Description
System Description	Shows the system description that would also appear on the Login page.

Printer Status

From the **Status** menu, choose the **Printer** item, and the **Printer Information** screen appears. This screen provides the following information about the USB printer connected to the USB port.



Printer Status	
Item	Description
Manufacturer	Displays the name of the USB printer manufacturer.
Model	Displays the model of the USB printer.
Status	Displays the status of the USB printer.
Printer Queue	Click to remove all documents from printer queue

If a corrupt print job is sent to a printer, printing may suddenly fail. If your print jobs seem to be locked up, pressing the **Remove All Documents** button to clear the print queue may resolve the issue.

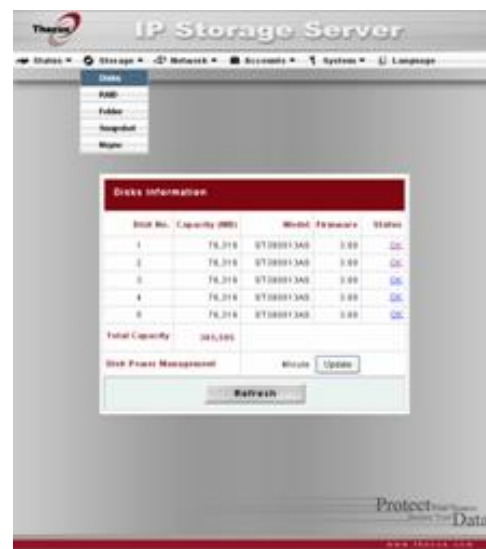
For information on how to set up the Printer Server, refer to [Chapter 4: Printer Server](#).

Storage Management

The **Storage Menu** displays the status of storage devices installed in the 1U4500, and includes storage configuration options such as RAID and disk settings, folder configuration, and Nsync settings.

Disks Information

From the **Storage** menu, choose the **Disks** item and the **Disks Information** screen appears. From here, you can see various items about installed SATA hard disks. Blank lines indicate that a SATA hard disk is not currently installed in that particular disk slot. If there is a problem with a disk, a **Failed** message will be displayed in the **Status** column.



Disks Information	
Item	Description
Disk No.	Indicates disk location.
Capacity	Shows the SATA hard disk capacity.
Model	Displays the SATA hard disk model name.
Firmware	Shows the SATA hard disk firmware version.
Status	Indicates the status of the disk. Can read OK , Warning , or Failed .
Total Capacity	Shows the total SATA hard disk capacity.
Disk Power Management	The administrator can set the disk to power down after a period of inactivity.

NOTE

When the Status shows Warning, it usually means there are bad sectors on the hard disk. It is shown only as a precaution and you should consider changing the drives.

S.M.A.R.T. Information

On the **Disks Information** screen, the status of each disk will be displayed in the **Status** column. Clicking on an **OK** or **Warning** link will display the **S.M.A.R.T. Information** window for that particular disk.

SMART INFO	
Power On Hours	1644 Hours
Reallocated Sector Count	0
Current Pending Sector	0
CANCEL	

S.M.A.R.T. Information	
Item	Description
Power ON Hours	Count of hours in power-on state. The raw value of this attribute shows total count of hours (or minutes, or seconds, depending on manufacturer) in power-on state.
Reallocated Sector Count	Count of reallocated sectors. When the hard drive finds a read/write/verification error, it marks this sector as "reallocated" and transfers data to a special reserved area (spare area). This process is also known as remapping and "reallocated" sectors are called remaps. This is why, on a modern hard disks, you can not see "bad blocks" while testing the surface - all bad blocks are hidden in reallocated sectors. However, the more sectors that are reallocated, the more a decrease (up to 10% or more) can be noticed in disk read/write speeds.
Current Pending Sector	Current count of unstable sectors (waiting for remapping). The raw value of this attribute indicates the total number of sectors waiting for remapping. Later, when some of these sectors are read successfully, the value is decreased. If errors still occur when reading sectors, the hard drive will try to restore the data, transfer it to the reserved disk area (spare area), and mark this sector as remapped. If this attribute value remains at zero, it indicates that the quality of the corresponding surface area is low.
Cancel	Press Cancel to go back to the Disks Information screen.

NOTE

If the Reallocated Sector Count or Current Pending Sector of a hard disk drive is not zero, the status of the disk will show "Warning". This warning is only used to alert the system administrator that there are bad sectors on the disk, and they should replace those disks as soon as possible.

RAID Information

From the **Storage** menu, choose the **RAID** item and the **RAID Information** screen appears.

RAID Information	
RAID Level	RAID 0
Total Capacity	100,720 MB
Status	Building 83.3%
Data Capacity	110 MB / 111,000 MB (0.1%)
Unallocated Capacity	0 MB / 10,000 MB (0.0%)
Used Capacity	1,000 MB
Used Percentage	7,820 MB (3.1%)
Stripe Size	64 KB
Rebuilding Time	10 Days
Rebuild Speed	Low High Apply
To only add new disk to spare disk 1 Automatic Warning Apply	
Cancel	

RAID Information	
Item	Description
RAID Level	Shows the current RAID configuration.
Total Capacity	Shows total capacity of the RAID configuration.
Status	Indicates status of the RAID. Can read either Healthy , Degraded , or Damaged .
Data Capacity	Indicates the used capacity, total capacity, and current percentage used by user data.
Snapshot Capacity	Indicates the used capacity, total capacity, and current percentage used by the Snapshot.
USB Capacity	Indicates the used capacity, total capacity, and current percentage used by the target USB mode.
Capacity Used	Displays the total space available and total space used on the RAID.
Stripe Size	Shows the current disk stripe size.
Remaining Time	Indicates time remaining until the RAID is finished building.
Rebuild Speed	Configures the speed of the RAID rebuild. Low : the rebuild will be longer, but the system will be more responsive to file requests. High : the rebuild will be faster, but the system will be less responsive to file requests.
Add new disk as spare disk?	When adding a new disk, this setting determines whether the system will add the new disk as a spare disk of the existing RAID.

To configure your RAID settings, press the **Config** button to go to the **RAID Configuration** screen.

RAID Configuration

On the **RAID Information** screen, press the **Config** button to go to the **RAID Configuration** screen. In addition to RAID disk information and status, this screen lets you make RAID configuration settings.

For more information on RAID, see [Appendix C: RAID Basics](#).



RAID Level

You can set the storage volume as either **None**, **JBOD**, **RAID 0**, **RAID 1** or **RAID 5**. RAID configuration is usually required only when you first set up the device. A brief description of each RAID setting follows:

RAID Levels	
Level	Description
None	There is no existing storage volume.
JBOD	The storage volume is a single HDD with no RAID support. JBOD requires a minimum of 1 disk.
RAID 0	Provides data striping but no redundancy. Improves performance but not data safety. RAID 0 requires a minimum of 2 disks.

RAID 1	Offers disk mirroring. Provides twice the read rate of single disks, but same write rate. RAID 1 requires a minimum of 2 disks.
RAID 5	Data striping and stripe error correction information provided. Excellent performance and good fault tolerance. RAID 5 requires a minimum of 3 disks. RAID 5 can sustain one failed disk.
RAID 6	Two independent parity computations must be used in order to provide protection against double disk failure. Two different algorithms are employed to achieve this purpose. RAID 6 requires a minimum of 4 disks. RAID 6 can sustain two failed disks.
RAID 10	RAID 10 has high reliability and high performance. RAID 10 is implemented as a striped array whose segments are RAID 1 arrays. It has the fault tolerance of RAID 1 and the performance of RAID 0. RAID 10 requires 4 disks. RAID 10 can sustain two failed disks.

WARNING

If the administrator improperly removes a hard disk that should not be removed when RAID status is Degraded, all data will be lost.

Disk Settings

Using **Disk Settings**, you can select stripe size, choose which disks are RAID disks or the Spare Disk, as well as enter a name for each disk.

Disk Settings	
Item	Description
RAID	Check the boxes of the hard drives you wish to add to the storage volume.
Spare	Check a box to designate the replacement HDD for the storage volume. This becomes the backup for any damaged hard drives.
Stripe Size	This sets the stripe size to maximize performance of sequential files in a storage volume. Keep the 64K setting unless you require a special file storage layout in the storage volume. A larger stripe size is better for large files.
User Percentage	Data Percentage: The percentage of the RAID volume that will be used to store data. Target USB Percentage: The percentage of RAID volume that will be used as USB disk. Snapshot Percentage: The rest of the RAID volume will be used to store the Snapshot.
Add Linear	Under JBOD mode, if you would like to add more disks to the current RAID, select a disk by clicking on the checkbox in the RAID column for that disk and click Add Linear to add the new disk into the RAID volume.
Add Spare	Press this button to add a new Spare disk.
Remove	Click to remove the RAID volume. All user data, snapshot, and Target USB data will be removed.
Create RAID	Press this button to configure a file system and create the RAID storage volume.

Creating a RAID

To create a RAID volume, follow the steps below:

1. On the **RAID Configuration** screen, set the RAID storage space as **JBOD**, **RAID 0**, **RAID 1**, **RAID 5**, **RAID 6**, or **RAID 10** — see [Appendix C: RAID Basics](#) for a detailed description of each.
2. Tick the checkboxes of the hard disks you wish to use to create a RAID.

3. Specify a stripe size — 64K is the default setting.
4. Press **Create** to build the RAID storage volume.

NOTE

Building a RAID storage space may take time, depending on the size of hard drives and RAID mode.

WARNING

Creating RAID destroys all data in the current RAID. The data is unrecoverable.

With a RAID 5 array, you can also add a spare disk after the RAID is created. See **Chapter 7: Tips and Tricks > Adding a Spare Disk** for details.

When you create RAID, you can assign a portion of space on the RAID to be used as a USB disk. For instructions on how to do this, see **Chapter 7: Tips and Tricks > Target USB**.

Deleting a RAID

To delete a RAID volume, follow the steps below:

1. On the **RAID Configuration** screen, click **Remove RAID**.
2. The system automatically rebuilds and you can create a new RAID.

WARNING

Removing RAID destroys all data in the current RAID. The data is unrecoverable.

Advanced RAID Configuration

Scroll to the bottom half of the RAID Configuration screen, you will see **RAID Advanced Configuration** screen. Advanced RAID Configuration options include RAID Migration and RAID Expansion. Descriptions of each are below:

Advanced RAID Configuration	
Item	Description
RAID Migration	Changes the number of disks or RAID level in current RAID configuration. The system will list the possible migration paths, and enable you to choose a possible path. For example, RAID 1 with two disks can be migrated to RAID 5 with 3 disks or RAID 5 with 3 disks can be migrated to RAID 5 with 4 disks. RAID levels currently supported are : RAID 0, 1, 5.
RAID Expansion	When larger disks have replaced the smaller disks thru RAID Rebuild, the file system on the RAID is not changed. You can press this button to check to see if there is room to expand the file system. If yes, then the file system will grow to take advantage of the larger disks.

NOTE

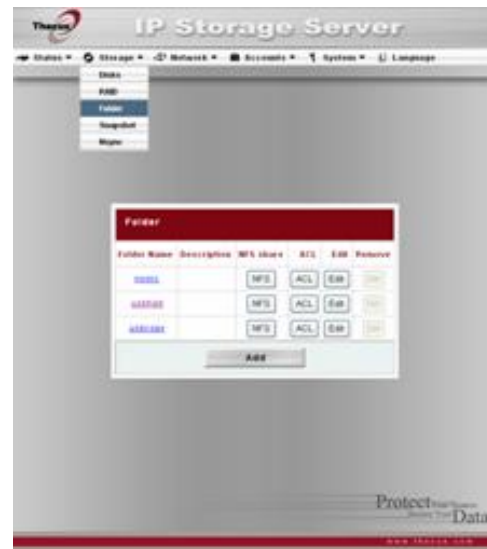
During RAID Migration and RAID Expansion, all the file services such as SMB/CIFS, AFP, NFS, and FTP will not be available. The time to finish these operations depends on the size of your hard disk drives and your RAID volume.

WARNING

- RAID Migration and Expansion are inherently risky operations. Please make sure your system is protected by a UPS (Uninterruptible Power Supply) to prevent accidental power failure, which might result data loss.
- These operations will cause heavy loading on your RAID system. RAID Migration and RAID Expansion will not be available if your RAID is in a degraded state.

Folder Management

From the **Storage** menu, choose **Folder**, and the **Folder** screen appears. This screen allows you to create and configure folders on the 1U4500 volume.



Folder	
Item	Description
Folder name	Displays the name of the folder.
Description	Provides a description of the folder.
NFS Share	Press NFS Share to configure which hosts on the network are allowed to access this folder using NFS.
ACL	Press ACL (Access Control List) to configure which users have access to this folder.
Edit	Press Edit to enter the Edit screen and modify the folder's name and description.
Del	Press Del to delete the folder. A prompt appears asking to confirm the deletion.
Add	Press Add to enter the Add Folder screen.

NOTE

Nsync folders will be created once the RAID is created. Nsync folder is used by Nsync server. It will be used for files backed up by Nsync.

Adding Folders

On the **Folder** screen, press the **Add** button and the **Add Folder** screen appears. This screen allows you to add a folder. After entering the information, press **Apply** to create new folder. Press **Back** to return to the **Folder** screen.



Add Folder	
Item	Description
Folder Name	Enter the name of the folder.
Description	Provide a description the folder.
Browseable	Enable or disable users from browsing the folder contents. If Yes is selected, then the share folder will be browseable.
Public	Admit or deny public access to this folder. If Yes is selected, then users do not need to have access permission to write to this folder. When accessing a public folder via FTP, the behavior is similar to anonymous FTP. Anonymous users can upload/download a file to the folder, but they cannot delete a file from the folder.
Share Folder Limit	Enter the maximum size of the folder. The folder cannot grow beyond this limit. You can enter a 0 to turn off the share folder limit.
Apply	Press Apply to create the folder.
Back	Press Back to return to the Folder screen.

NOTE

Folder names are limited to 60 characters. Systems running Windows 98 or earlier may not support file names longer than 15 characters.

Editing Folders

On the **Folder** screen, press the **Edit** button and the **Edit Folder** screen appears. This screen allows you to change folder information. After entering the information, press **Submit** to apply the changes. Press **Back** to return to the **Folder** screen.

Edit Folder	
Item	Description
Share Name	Enter the name of the (Share) folder.
Comment	Provide a description the folder.
Browseable	Enable or disable users from browsing the folder contents.
Public	Admit or deny public access to this folder.
Share Limit	Enter the maximum size of the folder. The folder will not grow beyond this limit. You can enter a 0 to turn off the share folder limit.
Submit	Press Submit to save your changes.
Back	Press Back to return to the Folder screen.

Deleting Folders

To delete a folder, press the **Del** button from the specified folder row. The system will confirm folder deletion. Press **OK** to delete the folder permanently or **Cancel** to go back to the folder list.

WARNING

All the data stored in the folder will be deleted once the folder is deleted. The data will not be recoverable.

NFS Share

To allow NFS access to the share folder, enable the **NFS Service**, and then set up hosts with access rights.

Config NFS share [nsync]				
Hostname	Privilege	Root Access	Edit	Remove
Add				

NFS Share	
Item	Description
Hostname	Enter the name of the Host or IP address
Privilege	Host has either read only or writeable access to the folder.
Root Access	Access the data on root directory of the RAID.

Folder Access Control List (ACL)

On the Folder screen, press the **ACL** button, and the **Access Control List** screen appears. This screen allows you to configure access to the specific folder for users and groups. Select a user or a group from the left hand column and then choose **Deny**, **Read Only**, or **Writable** to configure their access level. Press the **Submit** button to confirm your settings.

Access Control List	
Item	Description
Deny	Denies access to users or groups who are displayed in this column.
Read Only	Provides Read Only access to users or groups who are displayed in this column.
Writable	Provides Write access to users or groups who are displayed in this column.
Remove	Removes the selected user or group from the column in order to reset their access privileges.
Submit	Submits and confirms settings.
Reset	Cancel your settings and return to the Folder screen.

To configure folder access, follow the steps below:

1. On the **ACL** screen, all network groups and users are listed in the left hand column. Select a group or user from this list.
2. With the group or user selected, press one of the buttons from the three access level columns at the top. The group or user then appears in that column and has that level of access to the folder.
3. Continue selecting groups and users and assigning them access levels using the column buttons.
4. To remove a group or user from an access level column, press the **Remove** button in that column.
5. When you are finished, press **Submit** to submit and confirm your ACL settings.

System Snapshots

This function will create snapshots of all your share folders. The snapshot versions will be time stamped.

Snapshot	
Item	Description
Manual	Press to manually create a snapshot.
Schedule	Create snapshots at designated intervals.

To schedule a snapshot at designated times, press the **Schedule** button and set your desired snapshot options:

Item	Description
Automatically remove oldest snapshot	When a snapshot is created and it is over the system limit. The oldest snapshot will be removed automatically to make room for the new snapshot.
Enable snapshot schedule	To Enable scheduling mechanism of snapshot.
Monthly	To create a snapshot using a monthly interval.
Weekly	To create a snapshot using a weekly interval.
Daily	To create a snapshot using a daily interval.

WARNING

This operation will cause heavy loading on your RAID system. If your RAID is degraded, please disable this function and replace damaged disk as soon as possible.

Network Management

Use the **Network** menu to make network configuration settings as well as service support settings.

WAN Configuration

From the **Network** menu, choose **WAN**, and the **WAN Configuration** screen appears. This screen displays the network parameters of the WAN connection. You may change any of these items and press **Apply** to confirm your settings. See a description of each item in the following table:



WAN Configuration	
Item	Description
Host name	Host name that identifies the 1U4500 on the network.
Domain name	Specifies the domain name of the 1U4500.
MAC Address	MAC address of the network interface.
Jumbo Frame Support	Enable or disable Jumbo Frame Support of the WAN interface on your 1U4500.
DHCP	Enable or disable the 1U4500 from obtaining in IP address via DHCP server. If you require a static IP, disable this feature and

	input your network configuration.
IP	IP address of the WAN interface.
Netmask	Network mask, which is generally: 255.255.255.0
Gateway	Default Gateway IP address.
DNS Server	Domain Name Service (DNS) server IP address.
IP Sharing Mode	When enabled, PCs connected to the LAN port will be able to access the WAN. Default is Enabled.
Link Aggregation	Specifies whether WAN and LAN ports will be aggregated and act as one port. Failover: When one port fails, the other one will take over. Load Balance: Ethernet traffic will flow alternative between two Ethernet ports.

NOTE

- Only use Jumbo Frame settings when operating in a Gigabit environment where all other clients have Jumbo Frame Setting enabled.
- Enabling DHCP automatically turns on UPnP—see the Service Support Screen.
- If you are only using the WAN port, we suggest that you disable IP Sharing Mode. This will result in higher throughput.
- A correct DNS setting is vital to networks services, such as SMTP and NTP.
- To use the Link Aggregation feature, please make sure the networking equipment on the other end of Ethernet cable also supports 802.3ad protocol.

WARNING

Most Fast Ethernet (10/100) Switches/Routers do not support Jumbo Frame and you will not be able to connect to your 1U4500 after Jumbo Frame is turned on. If this happens, turn off the 1U4500. Then, power on the 1U4500 and immediately press and hold the Reset button on the back of the unit for 10 seconds. This will reset your network settings, password, and turn off Jumbo Frame Support.

LAN Configuration

The 1U4500 supports two Gigabit Ethernet ports for higher service availability. To configure these ports, choose **LAN** from the **Network** menu, and the **LAN Configuration** screen appears. Press **Apply** to save your changes.



LAN Configuration	
Item	Description
MAC Address	Displays the MAC address of the LAN interface.
IP	Specifies the IP address of the LAN interface.
Netmask	Specifies the Network Mask of the LAN interface.
Jumbo Frame Support	Enable or disable Jumbo Frame Support on the LAN interface.

NOTE

Before enabling Jumbo Frame Support, please make sure your network equipment supports Jumbo Frame. If your equipment is incompatible, you might not be able to connect to your 1U4500. In this case, you have to reset the system back to default by the holding down front panel reset button for 5 seconds during boot up process.

DHCP Configuration

A DHCP server can be configured to assign IP addresses to devices connected to the LAN port. To configure these ports, choose **LAN** from the **Network** menu.

DHCP Configuration	
Item	Description
DHCP Server	Enable or disable the DHCP server to automatically assign IP address to PCs connected to the LAN interface.
Start IP	Specifies the starting IP address of the DHCP range.
End IP	Specifies the ending IP address of the DHCP range.
DNS Server	Specifies the DNS server IP address.

NOTE

The IP Segment of WAN and LAN should not overlap.

WARNING

The IP address of the LAN interface should not be in the range of the Start IP address and End IP address.

Web Services Configuration

From the **Network** menu, choose the **Service** item, and the **Web Service** screen appears. This screen displays the service support parameters of the system. You can change any of these items and press **Apply** to confirm your settings. A description of each item follows:



Web Service	
Item	Description
HTTP (WebDisk) Support	Enable or disable WebDisk support. Enter the port number if this option is enabled.
HTTPs (Secure WebDisk) Support	Enable or disable secure WebDisk support. Enter the port if this option is enabled.
SMB/CIFS	Enable or Disable SMB/CIFS protocol for Windows, Apple, Unix drive mapping.
UPnP	Enable or disable Universal Plug and Play protocol. UPnP helps to find the IP address of the 1U4500.

NOTE

- Disable HTTP support and Enable Secure HTTP support to guarantee secure access.
- In some environments, due to security concerns, you may wish to disable SMB/CIFS as a precaution against computer viruses.

AFP (Apple Network Setup)

From the **Network** menu, choose the **AFP** item, and the **AFP Configuration** screen appears. This screen displays the configuration items for the Apple Filing Protocol. You can change any of these items and press **Apply** to confirm your settings. A description of each item follows:



Apple Network Configuration	
Item	Description
AFP Server	Enable or disable Apple File Service to use the 1U4500 with MAC OS-based systems.
MAC CHARSET	If your operating system does not support Unicode (e.g. MAC OS9/8), select the same language as your OS here in order to properly view the files and directories on the server.
Zone	Specifies Zone for Appletalk service. If your AppleTalk network uses extended networks and is assigned with multiple zones, assign a zone name to the 1U4500. If you do not want to assign a network zone, enter an asterisk (*) to use the default setting.

NFS Setup

From the **Network** menu, choose the **NFS** item, and the **NFS Server Setting** screen appears. The 1U4500 can act as an NFS server, enabling users to download and upload files with the favorite NFS clients. Press **Apply** to confirm your settings. A description of each item follows:



NFS Server Setting	
Item	Description
AFP Server	Enable or disable Apple File Service to use the 1U4500 with MAC OS-based systems.
Zone	Specifies Zone for Appletalk service. If your AppleTalk network uses extended networks and is assigned with multiple zones, assign a zone name to the 1U4500. If you do not want to assign a network zone, enter an asterisk (*) to use the default setting.

User and Group Management

The 1U4500 has built-in user database that allows administrators to manage user access using different group policies. From the **Accounts** menu, you can create, modify, and delete users, and assign them to groups that you designate.

Local User Configuration

From the **Accounts** menu, choose the **Users** item, and the **Local User Configuration** screen appears. This screen allows you to **Add**, **Modify**, and **Delete** local users.



Local User Configuration	
Item	Description
Add	Press the Add button to add a user to the list of local users.
Modify	Press the Modify button to modify a local user.
Delete	Press the Delete button to delete a selected user from the system.

Adding Users

1. Click on the **Add** button on **Local User Configuration** screen, and **Local User Setting** screen appears.
2. On the **Local User Setting** screen, enter a name in the **User Name** box.
3. Enter a password in the **Password** box and re-enter the password in the **Confirm** box.
4. Select which group the user will belong to. **Group Members** is a list of groups this user belongs to. **Group List** is a list of groups this user does not belong to. Use the << or >> buttons to have this user join or leave a group.
5. Press the **Apply** button and the user is created.

NOTE

All users are automatically assigned to the 'users' group.

Modifying Users

1. Select an existing user from the **Local User Configuration** screen.
2. Click on the **Modify** button, and **Local User Setting** screen appears.
3. From here, you can enter a new password and re-enter to confirm, or use the << or >> buttons to have this user join or leave a group. Click the **Apply** button to save your changes.



Deleting Users

1. Select an existing user from the **Local User Configuration** screen.
2. Click on **Delete** button and the user is deleted from the system.

Local Groups Configuration

From the **Accounts** menu, choose the **Groups** item, and the **Local Groups Configuration** screen appears. This screen allows you to **Add**, **Modify**, and **Delete** local groups.



Local Groups Configuration	
Item	Description
Add	Press the Add button to add a user to the list of local groups.
Modify	Press the Modify button to delete a selected group from the system.
Delete	Press the Delete button to delete a selected group from the system.

Adding Groups

1. On the **Local Group Configuration** screen, click on the **Add** button.
2. The **Local Group Setting** screen appears.
3. Enter a **Group Name**, and select users to be in this group from the **Users List** by adding them to the **Members List** using the << button.
4. Click the **Apply** button to save your changes.

Modifying Groups

1. On the **Local Group Configuration** screen, select a group name from the list.
2. Press the **Modify** button to modify the members in a group.
3. To add a user into a group, select the user from the **Users List**, and press the << button to move the user into the **Members List**.
4. To remove a user from a group, select the user from **Members List**, and press the >> button.
5. Click the **Apply** button to save your changes.



Deleting Groups

1. On the **Local Group Configuration** screen, select a group name from the list.
2. Press **Delete** to delete the group from the system.

ADS/NT Configuration

If you have a Windows Active Directory Server (ADS) or Windows NT server to handle the domain security in your network, you can simply enable the ADS/NT support feature; the 1U4500 will connect with the ADS/NT server and get all the information of the domain users and groups automatically. From the **Accounts** menu, choose **Authentication** item and the **ADS/NT Support** screen appears. You can to change any of these items and press **Apply** to confirm your settings. A description of each item follows:



ADS/NT Support	
Item	Description
WINS Server	Specifies the WINS server if necessary.
Work Group / Domain Name	Specifies the SMB/CIFS Work Group / ADS Domain Name (e.g. 1U4500).
ADS/NT Support	Select Disable to disable authentication through Windows Active Directory Server or Windows NT.
Authentication Method	Select ADS for Windows Active Directory Server, or select NT for Windows NT.
ADS/NT Server Name	Specifies the ADS/NT server name (e.g. adservername).
ADS/NT Realm	Specifies the ADS/NT realm (e.g. example.com).
Administrator ID	Enter the administrators ID of Windows Active Directory or Windows NT, which is required for 1U4500 to join domain.
Administrator Password	Enter the ADS/NT Administrator password.
Confirm Password	For re-entering password to confirm.

To join an AD domain, you can use the example below to configure the 1U4500:

AD Domain Example	
Item	Information
Work Group / Domain Name	Thecus
ADS Support	Enable
ADS Server Name	ADServer
ADS/NT Realm	thecus.com
Administrator ID	Administrator
Administrator Password	*****
Confirm Password	*****

NOTE

- The DNS server specified in the WAN configuration page should be able to correctly resolve the ADS server name.
- The time zone setting between 1U4500 and ADS should be identical.
- The system time difference between 1U4500 and ADS should be less than five minutes.
- The Administrator Password field is for the password of ADS (Active Directory Server) not 1U4500.

System Management

The **System** menu gives you a wealth of settings that you can use to configure your 1U4500's system administration functions. You can set up system notifications, view system logs, and even upgrade firmware from this menu.

System Notifications

From the **System** menu, choose the **Notification** item, and the **Notification Configuration** screen appears. This screen lets you have the 1U4500 notify you in case of any system malfunction. Press **Apply** to confirm all settings. See following table for a detailed description of each item.

Notification Configuration	
Item	Description
Beep Notification	Enable or disable the system beeper that beeps when a problem occurs.
Email Notification	Enable or disable email notifications of system problems.
SMTP Server	Specifies the hostname/IP address of the SMTP server.
Port	Specifies the port to send outgoing notification emails.
Auth Type	Select the SMTP Server account authentication type.
SMTP Account ID	Set the SMTP Server Email account ID.
Account Password	Enter a new password.
Confirm Account Password	Confirm a new password.
Receiver's E-mail Address	Add one or more recipient's email addresses to receive email notifications.
Test E-Mail	Click to send out a test e-mail to make sure the settings are correct.

NOTE

Consult with your mail server administrator for email server information.

System Logs

From the **System** menu, choose the **Logs** item and the **System Logs** screen appears. This screen shows a history of system usage and important events such as disk status, network information, and system booting. See the following table for a detailed description of each item:



System Logs	
Item	Description
Truncate All Log File	Clear all log files.
<< < > >>	Use the forward (> >>) and backward (<< <) buttons to browse the log pages.
INFO	Provides all log information including warning messages and error messages.
WARN	Shows all warning messages and error messages.
ERROR	Shows only error messages.
GO	Specify the number of lines per page and press Go.
Ascending	Shows logs by date in ascending order.
Descending	Shows logs by date in descending order.
Download All Log File	Export all logs to an external file.

Time and Date Settings

From the **System** menu, choose the **Time** item and the **Time** screen appears. Set the desired **Date**, **Time**, and **Time Zone**. You can also elect to synchronize the system time on the 1U4500 with an **NTP (Network Time Protocol) Server**. You can change any of these items and press **Apply** to confirm your settings.

See the following table for a detailed description of each item:



Time	
Item	Description
Date	Sets the system date.
Time	Sets the system time.
Time Zone	Sets the system time zone.
NTP Server	Select Yes to allow the 1U4500 to synchronize with the NTP server shown below. Select Manually to allow the 1U4500 to synchronize with an NTP server of your choice. Select No to not have the 1U4500 to synchronize with an NTP server.

WARNING

If an NTP server is selected, please make sure your 1U4500's network has been setup to access the NTP server.

System Configuration Backup and Restore

From the **System** menu, choose the **Config Mgmt** item and the **System Configuration Download/Upload** screen appears. From here, you can download or upload stored system configurations. See the following table for a detailed description of each item.



System Configuration Download/Upload	
Item	Description
Download	Save and export the current system configuration.
Upload	Import a saved configuration file to overwrite current system configuration.

NOTE

Backing up your system configuration is a great way to ensure that you can revert to a working configuration when you are experimenting with new system settings.

Reset to Factory Default Settings

From the **System** menu, choose the **Factory Default** item and the **Reset to Factory Default** screen appears. Press **Apply** to reset the 1U4500 to factory default settings. Press **Cancel** to go back to the main menu.



WARNING

Resetting to factory defaults will not erase the data stored in the hard disks, but WILL revert all the settings to the factory default values.

Upgrading System Firmware

From the **System** menu, choose the **Firmware Upgrade** item and the **Firmware Upgrade** screen appears.

Follow the steps below to upgrade your firmware:

1. Use the **Browse** button to find the firmware file.
2. Press **Apply**.
3. The beeper beeps and the Busy LED blinks until the upgrade is complete.



NOTE

- The beeper only beeps if it is enabled in the System Notification menu.
- Check Thecus website for the latest firmware release and release notes.
- Downgrading firmware is not permitted.

WARNING

Do NOT turn off the system during the firmware upgrade process. This will lead to a catastrophic result that may render the system inoperable.

Change Administrator Password

From the **System** menu, choose the **Administrator Password** item and the **Change Administrator Password** screen appears. Enter a new password in the **New Password** box and confirm your new password in the **Confirm Password** box. Press **Apply** to confirm password changes. See the following table for a detailed description of each item.



Change Administrator Password	
Item	Description
New Password	Type in a new administrator password.
Confirm Password	Type the new password again to confirm.
Apply	Press this to save your changes.

Reboot and Shutdown System

From the **System** menu, choose **Reboot & Shutdown** item, and the **Shutdown/Reboot System** screen appears. Press **Reboot** to restart the system or **Shutdown** to turn the system off.



Logout

To logout of the Web Administration Interface, navigate to **System > Logout**.

Chapter 5: Additional Feature Setup

Overview

The 1U4500 can also act as an FTP Server, allowing employees and clients to transfer files using their favorite FTP programs. The integrated Print Server allows you to share a single USB printer with all users on the network. The following section shows you how.

FTP Server

1U4500 can act as a FTP server, enabling users to download and upload files with their favorite FTP programs. From the **Network** menu, choose the **FTP** item, and the **FTP** screen appears. You can change any of these items and press **Apply** to confirm your settings. A description of each item follows:



FTP	
Item	Description
FTP	Enable FTP Service on the 1U4500.
FTP ENCODE	If your FTP client or operating system does not support Unicode (e.g. Windows® 95/98/ME or MAC OS9/8), select the same encoding as your OS here in order to properly view the files and directories on the server. Available options are BIG5, HZ, GB2312, GB18030, ISO, EUC-JP, SHIFT-JIS and UTF-8.

To access the share folder on the 1U4500, use the appropriate user login and password set up on the **Users** page (**Accounts > Users**). Access control to each share folder is set up on the **ACL** page (**Storage > Folder > ACL**).

Printer Server

You can configure the 1U4500 to act as a printer server. That way, all PCs connected to the network can utilize the same printer.

Windows XP SP2

To set up the Printer Server in Windows XP SP2, follow the steps below:

1. Connect the USB printer to one of the USB ports (preferably the rear USB ports; front USB ports can be used for external HDD enclosures).
2. Go to **Start > Printers and Faxes**.
3. Click on **File > Add Printer**.
4. The **Add Printer Wizard** appears on your screen. Click **Next**.
5. Select the **"A network printer, or a printer attached to another computer"** option.
6. Select **"Connect to a printer on the Internet or on a home or office network"**, and enter **"http://1U4500_IP_ADDRESS:631/printers/usb-printer"** into the URL field.
7. Your Windows system will ask you to install drivers for your printer. Select correct driver for your printer.
8. Your Windows system will ask you if you want to set this printer as "Default Printer". Select **Yes** and all your print jobs will be submitted to this printer by default. Click **Next**.
9. Click **Finish**.



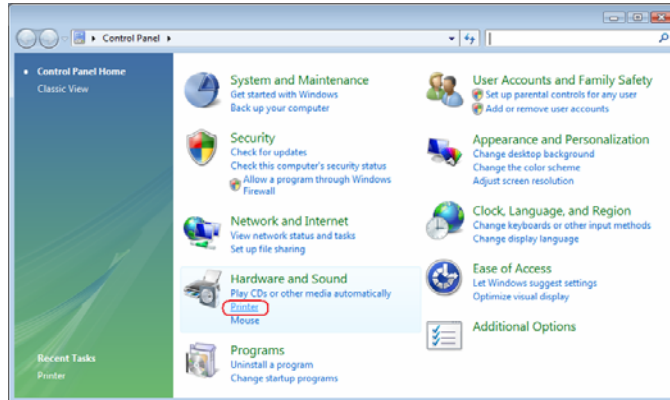
NOTE

- Not all USB printers are supported. Please check Thecus website for a list of supported printers.
- Note that if a multi-function (all-in-one) printer is attached to the 1U4500, usually only the printing and fax functions will work. Other features, such as scanning, probably will not function.

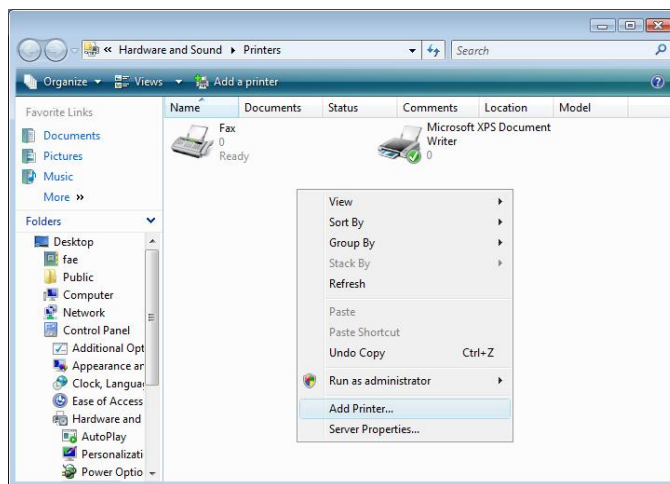
Windows Vista

To set up the Printer Server in Windows Vista, follow the steps below:

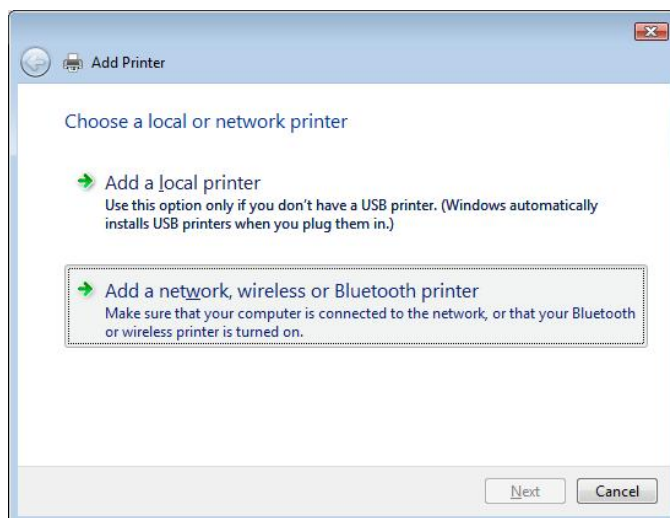
1. Open **Printer Folder** from the **Control Panel**.



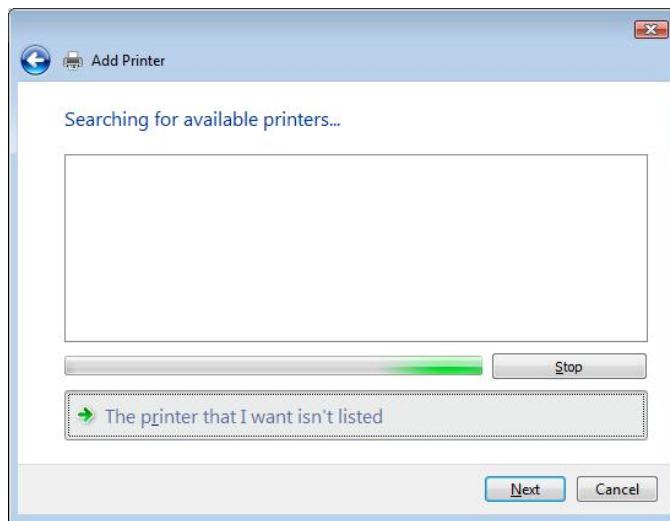
2. Click the right mouse button in anywhere on the **Printers** folder and then select **Add Printer**.



3. Select **Add a network, wireless or Bluetooth printer**.

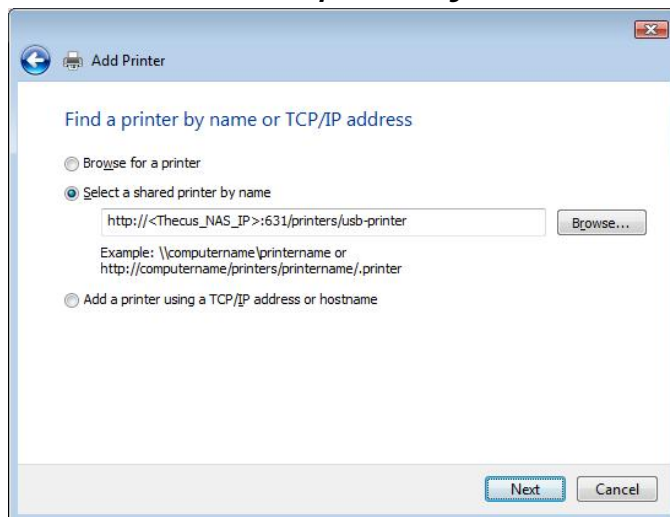


4. Select ***The printer that I want isn't listed***.



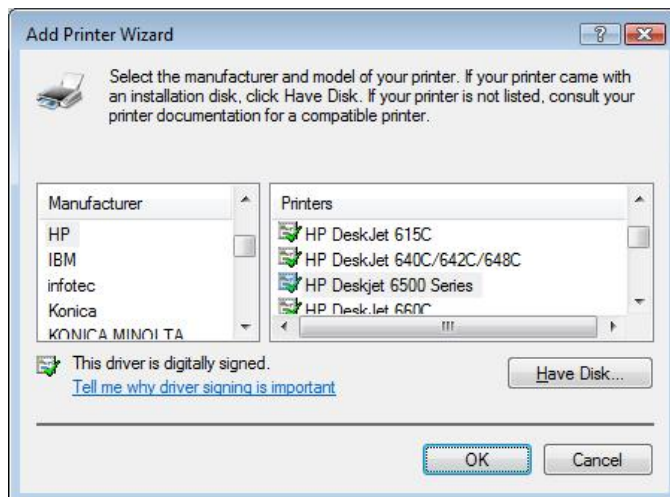
You can press ***The printer that I want isn't listed*** to go into next page without waiting for **Searching for available printers** to finish.

5. Click ***Select a shared printer by name***.



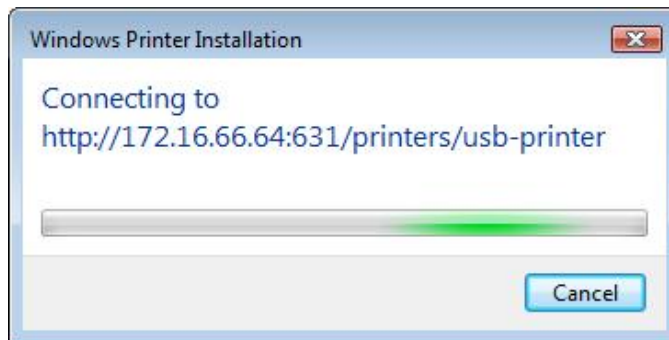
Type `http://<Thecus_NAS>:631/printers/usb-printer` in the box, where `<Thecus_NAS_IP>` is the IP address of the 1U4500. Click ***Next***.

6. Select or install a printer and then press ***OK***.

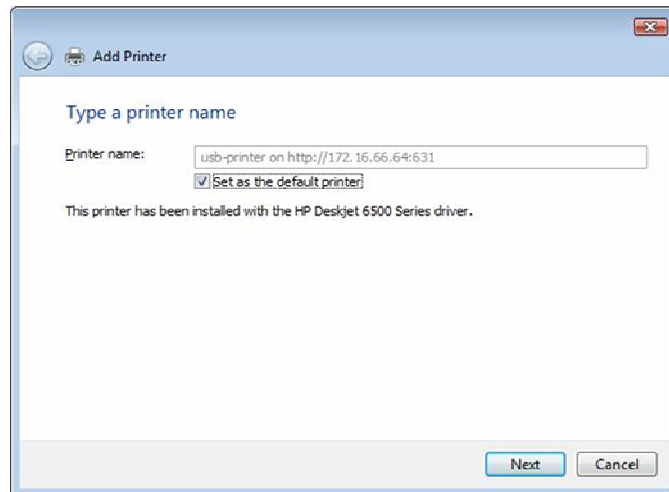


If your printer model is not listed, please contact your printer manufacturer for help.

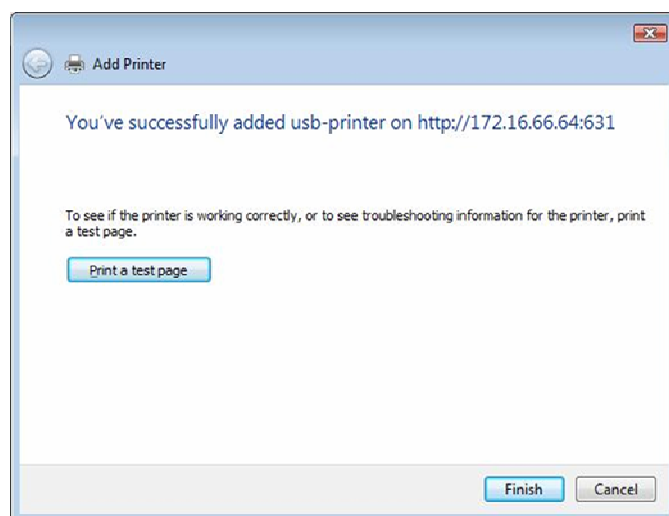
7. Windows will attempt to connect to the printer.



8. You can choose to set this printer as the default printer by checking the **Set as the default printer** box. Click **Next** to continue.



9. Done! Click **Finish**.



Chapter 6: Using the 1U4500

Overview

Once the U4500 is setup and operating, users on the network may manage all varieties of digital music, photos, or files by simply using their web browsers. To manage your personal files or access public files on the 1U4500, just enter its IP address into your browser (default IP address is `http://192.168.1.100`), and you will be taken to the **1U4500 Login** page.

NOTE

*Before proceeding, make sure that WebDisk Support or Secure WebDisk Support is enabled in the Service Support screen in the system's **Network** menu. See Service Support in Chapter 6: System Management.*

Login Page

To login to the system, enter your user name and password, and click **Login** to log into the system. You will be taken to the **WebDisk** interface.

Using WebDisk

The U4500 provides a WebDisk function that allows you to access the system over the Internet from any browser.

1. In the Login page, type in the User ID and password that were previously set for you in the Accounts menu. See **Chapter 4: System Management > User and Group Management > Local User Configuration**.
2. The WebDisk page appears showing folders made currently available to you via the **Access Control List (ACL)**.
3. Click on a folder name to enter the folder.
4. The folder's page appears displaying files and folders. Click on a file to download the file.

Folder Page	
Item	Description
Name	Displays the names of folders and files.
Size	Shows the size of folders and files.
Type	Displays the type of folders and files.
Modified Date	Shows the time of most recent modification of folders and files.

5. Buttons on the folder page allow you to create a new folder, upload files and delete files in the folder.

Folder Page Buttons	
Button	Description
Up	Goes to the previous folder level.
New folder	Creates a new folder.
New file (upload)	Uploads a file from your computer to the current folder.
Delete Selected Items	Deletes selected files and folders.

6. To create a new folder within the current folder, press the New folder button. When the screen appears enter a name for the folder. Press OK to create the folder.

7. To upload a file from your computer to the current folder, press the New file (upload) button. When the screen appears, press Browse and locate the file to upload. Press **OK** and the file is uploaded to the current folder.
8. To delete a file or folder, select the file or folder's check box. Press the Delete selected items button. You can also check the check box as the red circle indicates to select all files and folders in this folder.

To access folders with access control, you must first login with a local user account.

For more information on how to setup user rights to the folders, please check **Chapter 4: System Management > Folder Management > [Folder Access Control List \(ACL\)](#)**.

Mapping a Client PC to the 1U4500

You can map share folders on the 1U4500 so that you can access them as if they were drives on your computer. You can connect to the shared network folders on the 1U4500 as follows:

Windows

1. Go to the **My Computer** folder in Windows.
2. In the menu bar, select **Tools** and then **Map Network Drive...**
3. The **Map Network Drive** window appears.
4. Assign a drive letter for the share folder.
5. Click the **Browse** button to find the folder over your network. Alternatively, you may enter the folder name you wish to connect to or enter its IP address. (i.e. \\192.168.1.100\share)
6. Click **Finish**. When the **Connect As...** window appears, enter your user name and password.
7. Click **OK**. The share folder appears as the drive you assigned. You can now access this folder as though it were a drive on your computer.

Apple OS X

On an Apple computer, you can connect to shared computers and servers using a network address.

1. Choose **Go > Connect to Server...**
2. Enter the network address for the server in the Server Address text box.
When connecting using SMB/CIFS protocol, type:
smb://192.168.1.100/Folder1
When connecting using AFP protocol, type:
afp://192.168.1.100/Folder1
Click **Connect**.
3. When MAC OS X is trying to connect 1U4500, it will ask for a User Name and Password which has access to the folder.

4. When MAC OS X has connected to the 1U4500 successfully, an icon representing the folder will appear on the MAC OS X desktop. You can access the folder by double clicking on the icon.

File Backup

There are a number of ways to back up data with the 1U4500.

Nsync

You can backup a share folder to another 1U4500 (Nsync Target) or any FTP server for safe keeping as long as you have appropriate access right on that target. When using Nsync between two 1U4500s, you have the option to transmit files securely between two 1U4500s.

If the files on your 1U4500 are lost for any reason, you can restore those files from the target 1U4500. To backup files regularly, you can set up a scheduled task to run only once, daily, weekly, or monthly. You can also limit the bandwidth of your Nsync tasks, so other users on the network can share the bandwidth equally.

Nsync	
Item	Description
Task	The name of your Nsync task.
Server	The IP address of your target server
Share folder	The share folder you would want to backup.
Last Time	The time when the last Nsync task was executed.
Last Status	The status of your last Nsync task.
Action	Administrator can run or stop an Nsync task by pressing the Action button.
Add	Click to add a Nsync task
Modify	Click to modify an Nsync task.
Delete	Click to delete an Nsync task. Backup files on Nsync target is also deleted.
Restore	Restore share folder from an Nsync target.
Bandwidth Setting	Bandwidth control on Nsync tasks.

Adding an Nsync Task

From the **Storage** menu, click **Nsync** and the **Nsync Information** screen appears. Click **Add** to display the **Add Nsync Task** screen.

Add Nsync Task	
Item	Description
Task Name	The name of your Nsync task.
Manufacturer	Select whether the target is a Thecus Product (e.g. 1U4500) or FTP server.
Target Server IP Address	The IP address of your target server.
Source Folder	The share folder you want to backup.
Nsync Task Name	The name of your Nsync task.
Authorized Username on Target Server	The account name on the target server.
Password on Target Server	The password for the username on the target server.
Test Connection	Click to check the connection to the Target Server.
Schedule	Schedule backup of your share folders.
Time	The time when the Nsync task will run.
Type	Select whether to run the Nsync task daily, weekly, or monthly. Daily: input the time of day to execute Nsync task.

	Weekly: input which day of the week to execute the task. Monthly: decide which day of the month to execute the task.
Apply	Click to submit the task.

NOTE

Before starting an Nsync Task, make sure the target server's Nsync Server (or FTP Server) is enabled.

Setting Up an Nsync Target on an Nsync Device

On the Nsync target server, the administrator of that server has to set up a user account with a folder named "nsync" and grant write access.

1. On the Nsync server, add a user for Nsync source (ex. nsyncsource1). For instructions on how to add a user on the 1U4500, see **Chapter 4: System Management > User and Groups Management > Local User Configuration > Adding Users**.
2. On the Nsync server, grant that user (ex. nsyncsource1) write access to the **nsync** folder. For instructions on how to set up a folder's ACL, see **Chapter 4: System Management > Folder Management > Folder Access Control List (ACL)**.
3. Once this is done, the target server will start accepting Nsync tasks from server using that ID and password.

Setting Up an Nsync Target on Another Device

If you selected "Other Device" when setting up your Nsync task, the 1U4500 will use the FTP protocol to back up the share folder. On the external storage device, make sure there is a folder named "nsync", and the Auth ID has writable permission in that folder.

Designating 1U4500 as an Nsync Target

The 1U4500 can act as an Nsync server, enabling another Nsync-equipped Thecus NAS at a remote location backup their files to this 1U4500. From the **Network** menu, choose the **Nsync Target** item, and the **Nsync Target Server Setting** screen appears.

Nsync Target Server Setting	
Item	Description
Nsync Target Server	Enable or Disable Nsync Target support.

NOTE

To enable Nsync task to go thru firewall, you have to open port TCP/1194 on your firewall in both directions.

Thecus Backup Utility

The Thecus Backup Utility is on your Installation CD. When you click on the CD, the Backup Utility will be installed under **Program Groups > Thecus > Thecus Backup Utility**. If it is not installed, you can copy the file (**Thecus Backup Utility.exe**) to a convenient location on your hard disk and double click to execute it.



NOTE

If you can not find Thecus Backup Utility on your CD, please download it from the Thecus website (<http://www.thecus.com>).

When you execute this utility for the first time, it will ask you whether to create a DB file. Click **Yes**.

1. Click **Add** to create a Backup task. The **Add New Task** dialog box appears.

Add New Task	
Item	Description
Task	Specifies a name for the current task.
Source	Click to specify the source folder/file location.
Incremental	Click to specify whether the backup will be incremental. If unchecked, the backup will be a full backup.
Destination	Click to specify the destination folder/file location.
Excluded extensions	Files with these file name extensions will be skipped and not back up to the destination.
Comments	If you wish, enter comments here for your records.

2. To schedule the task to run at regular intervals, click on the **Schedule** icon for that task. You can schedule the task to run **Monthly** or **Weekly**.
3. To check the log for that task, click on the **Log** icon for that task.

NOTE

Thecus Backup Utility also supports MAC OS X. Just copy the Thecus Backup Utility.dmg to your MAC OS X machine and double click to execute it.

Windows XP Data Backup

If you use Windows XP Professional, you can also use the Windows Backup Utility (Ntbackup.exe) to backup your files.

If you use Windows XP Home Edition, follow these steps to install the utility:

1. Insert the Windows XP CD into a drive and double-click the **CD** icon in **My Computer**.
2. When the Welcome to Microsoft Windows XP screen appears, click **Perform Additional Tasks**.
3. Click **Browse this CD**.
4. In Windows Explorer, navigate to **ValueAdd > Msft > Ntbackup**.
5. Double-click **Ntbackup.msi** to install the backup utility.

Once installed, you can use the Windows Backup Utility by following the steps below:

1. Click **Start**, and point to **All Programs > Accessories > System Tools > Backup** to start the wizard.
2. Click **Next** to skip past the opening page. Choose **Backup files and settings** from the second page, and then click **Next**.
3. Select which option you want to back up.
4. Click **Next** and in the Backup Type, Destination, and Name page, specify a back up location using the **Browse** button.
5. Find and select the drive that specifies your 1U4500 as your backup destination and click **Next**.
6. Click **Next** to display the wizard's final page and click **Finish** to start backing up.

Apple OS X Backup Utilities

Mac OS X does not include any backup software. However, there are a number of backup solutions available for the Mac OS X, including: [iBackup](#), [Psyncx](#), [iMSafe](#), [Rsyncx](#), [Folder Synchronizer X](#), [Tri-BACKUP](#), [Impression](#), [Intego Personal Backup](#), [SilverKeeper](#), and Apple's dotMac Backup utility to name just a few. To find even more freeware and shareware backup utilities to choose from, go to [VersionTracker](#) or [MacUpdate](#) and search on "backup".

Chapter 7: Tips and Tricks

USB and eSATA Storage Expansion

The 1U4500 supports external USB hard disks through its three USB ports. Once a USB hard disk has successfully mounted, the entire volume will be copied automatically to the default USB HDD folder. The 1U4500 supports up to 6 USB external storage devices. All file names on the USB disk volume are case sensitive.

The 1U4500 also supports eSATA hard disks with its eSATA port.

Before attaching an eSATA or USB disk drive to 1U4500, you have to partition and format it on a desktop computer or a notebook first. The attached device will be located at \\192.168.1.100\usbhdd\sdf1 where 192.168.1.100 means the IP address of 1U4500 and sdf1 stands for the first partition on disk #6, the eSATA or USB disk drive. If it is an NTFS partition, NAS users can open or copy files from \\192.168.1.100\usbhdd\sdf1 but cannot add new files or modify existing files.

NOTE

If you want to write to an USB storage device, the file system must be FAT32.

USB Storage	FAT32 Partition	NTFS Partition
Read	OK	OK
Write	OK	-

Adding a Spare Disk

With a RAID 5 array, you can add a spare disk after the initial RAID is setup. To add a spare disk, follow the steps below:

1. On the **RAID Configuration Screen**, tick the checkbox of the hard disk you wish to designate as a spare disk.
2. Click **Add Spare**. The system automatically rebuilds.

Target USB

1U4500 can operate in dual mode. When connecting to a regular USB disk or thumb drive, 1U4500 is acting as USB host. When connecting to a PC thru its USB Type B connector on the back panel, 1U4500 can act as a USB Mass Storage device. This feature allows the user to transfer files without using a network connection.

When you create RAID, you can assign a portion of space on the RAID to be used as USB disk. When connecting 1U4500 to a PC using the supplied USB A to B cable, the PC will recognize this space as an unformatted disk. At this point, the PC can format this portion of disk and create file system on it. Since this disk is created on the RAID, it will be protected by the RAID level you select.

WARNING

When RAID is removed or damaged, all the data on the Target USB device will be deleted.

Remote Administration

You can set up your 1U4500 for remote administration. With remote administration, you can access your 1U4500 over the Internet, even if your 1U4500 is behind a router. This is especially useful if you are traveling and suddenly need a file from your 1U4500.

Setting up remote administration is a three-part process, and will require the following equipment:

- Thecus 1U4500 NAS device
- Cable/DSL Router with Dynamic DNS support
- Home PC
- Internet Connection

NOTE

Router setup will differ slightly depending on router used. For this example, we will use the Asus WL500g because it has support for Dynamic DNS. Contact your router hardware vendor for setup help.

Part I - Setup a DynDNS Account

1. Go to <http://www.dyndns.org> from your home PC.
2. Click on the **Sign Up Now** link.
3. Check the Check boxes, select a user name (i.e.: 1U4500), enter your email address (i.e.: xxx@example.com), check **Enable Wildcard**, and create a password (i.e.: xxxx).
4. Wait for an email from www.dyndns.org.
5. Open the email and click on the link to activate your account

Part II - Enable DDNS on the Router

1. Go to the router setup screen and select **IP Config > Miscellaneous DDNS Setting** from your Home PC.
2. Click on **Yes** for **Enable the DDNS Client?**
3. Select **www.dyndns.org**.
4. Go to router setup screen, and enter the following information:
 - a. User Name or E-mail Address: **xxx@example.com**
 - b. Password or DDNS Key: **xxxx**
 - c. Host Name: **www.1U4500.dyndns.org**
 - d. Enable wildcard? Select **Yes**
 - e. Update Manually: Click **Update**

Part III - Setting up Virtual Servers (HTTPS)

1. Navigate to **NAT Setting > Virtual Server**.
2. For **Enable Virtual Server?**, select **Yes**
3. Setup the HTTPS Server
 - a. **Well-Known Applications**: Select **User Defined**
 - b. **Local IP**: Enter **192.168.1.100**
 - c. **Port Range**: **443** (the default HTTPS port setting on the 1U4500)
 - d. **Protocol**: select **TCP**
 - e. Click **Add**.
 - f. Click **Apply**.
4. Test the HTTPS connection from another computer on the Internet
 - a. From a remote computer, open your browser and enter **https://www.1U4500.dyndns.org**

- b. You should see the login page of 1U4500.

Firewall Software Configuration

If you are using a software firewall (i.e. Norton Internet Security) and are having trouble connecting to the 1U4500, you can try the following steps:

1. Double click the **NIS** icon on system tray, and then configure the **Personal Firewall**.
2. On the **Programs** page, find the **SetupWizard.exe** and change its permission to "Permit All". If it's not in the program list, use the **Add** or **Program Scan** buttons to find it.
3. On the **Networking** page, manually add 1U4500 IP address (i.e. 192.168.1.100) to the **Trusted** list.

Replacing Damaged Hard Drives

If you are using RAID 1, RAID 5, RAID 6, or RAID 10, you can easily replace a damaged hard drive in the Thecus 1U4500 while keeping your data secure with the system's automatic data recovery.

Hard Drive Damage

When a hard drive is damaged, its bottom LED glows a steady red. If there is data in the RAID volume, the system LED also glows red and the system beeps.

Replacing a Hard Drive

To replace a hard disk drive in the 1U4500:

1. Remove the tray with the damaged hard disk.
2. Unscrew the damaged hard disk and remove it from the tray.
3. Slide a new hard disk into the tray and fasten the screws.
4. Insert the hard disk tray back into the 1U4500 until it snaps into place. You can also lock it with a key if desired.
5. The LED blinks green when the HDD is accessed. If the Error LED flashes red, it signals a problem.

RAID Auto-Rebuild

When using RAID 1, 5, 6, or 10 on the 1U4500, you can use the auto-rebuild function when an error is detected.

1. When a hard disk fails the system beeps and/or an email notification is sent to specified receivers.
2. Check the hard disk error LEDs to see which disk has failed.
3. Follow the steps mentioned above to replace the failed hard disk.
4. The system automatically recognizes the new hard disk and starts the auto-rebuild sequence to resume its status before the hard disk crash.

Replacing a Failed Power Supply (1U4500R)

The 1U4500R is equipped with a 250W redundant power supply. If one of the power supply units fails, the other can continue powering the unit for uninterrupted service. Each power supply is equipped with an LED light that is lit when that power supply is operational. To replace a failed power supply, follow the steps below:

1. When a power supply fails, an alarm will sound and/or an email notification is sent to specified receivers.
2. Check the power supply LEDs to see which one has failed.
3. Disconnect the power cable.
4. Remove the mounting screw and slide out the failed power supply.
5. Install a working power supply unit and replace the screw.
6. Plug in the power cable.
7. The system automatically recognizes the power supply and will turn off the alarm. Check to see if the LED on the new power supply is lit.

To turn off the alarm at any time, simply press the Alarm Reset button at the back of the 1U4500R.

Chapter 8: Troubleshooting

Forgot My Password

If you forget your password, you can reset the unit to use the default password. To do this, press the reset button on the front panel after system is booted, and 1U4500 will be reset. LAN IP address will become 192.168.1.100 and admin password will be admin.

Forgot My Network IP Address

If you forget your network IP address and have no physical access to the system, you can find out the IP address by either looking directly onto the 1U4500's LCD panel, or by using the setup wizard to retrieve the IP of your 1U4500.

1. Start the Setup Wizard, and it will automatically detect all Thecus IP storage products on your network.
2. You should be able to find the IP address of the 1U4500 which you have forgotten in the **Device Discovery** screen.

Resetting NAS IP Address and Admin Password

In case you changed the 1U4500 IP address and then forgot it, or forgot the administration password, follow the steps below to reset to default settings:

1. Power on the 1U4500 and immediately press the **Reset** button for 10 seconds. (The reset button is near the LAN connector)
2. This resets the 1U4500 to its default IP address and password settings. For firmware v2.0.00 and later, Jumbo Frame support will also be disabled.

Default IP: 192.168.1.100 for LAN1 and 192.168.2.100 for LAN2

Default admin password: admin

Jumbo Frame support: disabled

Can't Map a Network Drive in Windows XP

You may have problems mapping a network drive under the following conditions:

1. The network folder is currently mapped using a different user name and password. To connect using a different user name and password, first disconnect any existing mappings to this network share.
2. The mapped network drive could not be created because the following error has occurred: **Multiple connections to a server or shared resource by the same user, using more than one user name, are not allowed.** Disconnect all previous connections to the server or shared resource and try again.

To check out existing network connections, type `net use` under the DOS prompt.

Restoring Factory Defaults

From the **System** menu, choose the **Factory Default** item and the **Reset to Factory Default** screen appears. Press **Apply** to reset the 1U4500 to factory default settings.

WARNING

Resetting to factory defaults will not erase the data stored in the hard disks, but WILL revert all the settings to the factory default values.

Problems with Time and Date Settings

The administrator is able to select an NTP Server to keep the 1U4500's time synchronized. However, if the 1U4500 can not access the Internet, you may encounter a problem when setting the Time and Time Zone. If this happens:

1. Login to the Web Administration Interface.
2. Navigate to **System > Time**.
3. Under **NTP Server**, select **No**.
4. Set the **Date**, **Time**, and **Time Zone**.
5. Click **Apply**.

In addition, if the 1U4500 is able to access the Internet and you want to keep the NTP Server clock.isc.org by default, please make sure the DNS Server is correctly, thereby allowing the NTP Server name to correctly resolve. (See **Network > LAN 1 > DNS Server**)

Appendix A: Product Specifications

Hardware Specifications

Product Model	1U4500R	1U4500S
Core Processors / Memory		
Processor	Intel® Celeron™ M 1.5GHz	
Memory	512MB standard	
Network Interfaces		
LAN 1	Gigabit RJ-45 connector	
LAN 2	Gigabit RJ-45 connector	
Storage		
HDD Bays	4 x 3.5" SATA II HDD, hot-swappable	
HDD Support	SATA II HDDs up to 750GB	
eSATA	1 x eSATA connector for capacity expansion	
I/O Interfaces		
USB Ports	3 x USB type A ports (Host mode) 1 x USB type B ports (Client mode)	
System Information		
LCD Control Panel	For basic configurations and status display	
System LED Display	4 x LED (System Busy, Power, Network Activity x 2)	
Physical		
Form Factor	1U rackmount	
Height	44.0 mm	
Width	430.5 mm	
Depth	567.6 mm	
Power Supply	250W redundant power supply 100~240V AC, 50/60Hz	200W power supply 100~240V AC, 50/60Hz
Environment		
Temperature	0 ~ 40°C	
Humidity	20 ~ 85% relative humidity (non-condensing)	
Certifications	CE, FCC, BSMI, C-Tick, RoHS Compliant	

Software Specifications

Network File Protocols	Microsoft Networks (CIFS/SMB) Apple Filing Protocol (AFP 3) Network File System (NFS v3) File Transfer Protocol (FTP) WebDisk via HTTP/HTTPs
Authentication	Local User Account Microsoft NT Domain Microsoft Active Directory Authentication (AD)*
Network Client Type	Microsoft Windows NT/2000/XP/2003 Unix/Linux/BSD MAC OS X/9/8.6
Network Configuration	Fixed IP address Dynamic IP address 802.3ad based failover and link aggregation
Disk Management	Disk status monitoring (S.M.A.R.T.)
RAID	RAID 0, 1, 5, 6, 10, and JBOD Auto rebuild Hot swappable Hot spare Disk roaming RAID level migration RAID expansion
Folder Management	Share folder level permission File level permission Public folder
Quota Management	Share folder quota control
Backup	Thecus Backup Utility for Windows XP/2000 and MAC OS X Thecus Nsync file-based remote back up service
System Management	Web GUI Multilingual support (English, French, German, Italian, Traditional Chinese, Simplified Chinese, Japanese, Korean, and Spanish) NTP support
Event Notification	Email notification Buzzer notification
UPS Support	UPS monitoring via RS-232 and system shutdown on low battery
Printer Server	USB Printer (IPP support)
Supported USB Devices	USB Printer External HDD/flash disk
Setup Utility	Windows 2000/XP/2003 MAC OS X

*PDC/AD support: Works as a client member in a Microsoft NT 4.0 domain/Active Directory domain, allowing the 1U4500 to utilize the domain users and groups setting for authentication to the system and authorization to the share folders.

Appendix B: Customer Support

If your 1U4500 is not working properly, we encourage you to check out **Chapter 7: Troubleshooting**, located in this manual. You can also try to ensure that you are using the latest firmware version for your 1U4500. Thecus is committed to providing free firmware upgrades to our customers. Our newest firmware is available on our Download Center:

<http://www.thecus.com/download.php>

If you are still experiencing problems with your 1U4500, or require a Return Merchandise Authorization (RMA), feel free to contact technical support via our Technical Support Website:

http://www.thecus.com/support_tech.php

Customers in the US should send all technical support enquiries to this email address:

support-us@thecus.com

For Sales Information you can e-mail us at:

sales@thecus.com

Thank you for choosing Thecus!



Appendix C: RAID Basics

Overview

A Redundant Array of Independent Disks (RAID) is an array of several hard disks that provide data security and high performance. A RAID system accesses several hard disks simultaneously, which improves I/O performance over a single hard disk. Data security is enhanced by a RAID, since data loss due to a hard disk failure is minimized by regenerating redundant data from the other RAID hard disks.

Benefits

RAID improves I/O performance, and increases data security through fault tolerance and redundant data storage.

Improved Performance

RAID provides access to several hard disk drives simultaneously, which greatly increases I/O performance.

Data Security

Hard disk drive failure unfortunately is a common occurrence. A RAID helps prevent against the loss of data due to hard disk failure. A RAID offers additional hard disk drives that can avert data loss from a hard disk drive failure. If a hard drive fails, the RAID volume can regenerate data from the data and parity stored on its other hard disk drives.

RAID Levels

The Thecus 1U4500 supports standard RAID levels 0, 1, 5, 6, 10, and JBOD. You choose a RAID level when you create a system volume. The factors for selecting a RAID level are:

- Your requirements for performance
- Your need for data security
- Number of hard disk drives in the system, capacity of hard disk drives in the system

The following is a description of each RAID level:

RAID 0

RAID 0 is best suited for applications that need high bandwidth but do not require a high level of data security. The RAID 0 level provides the best performance of all the RAID levels, but it does not provide data redundancy.

RAID 0 uses disk striping and breaking up data into blocks to write across all hard drives in the volume. The system can then use multiple hard drives for faster read and write. The stripe size parameter that was set when the RAID was created determines the size of each block. No parity calculations complicate the write operation.

RAID 1

RAID 1 mirrors all data from one hard disk drive to a second one hard disk drive, thus providing complete data redundancy. However, the cost of data storage capacity is doubled.

This is excellent for complete data security.

RAID 5

RAID 5 offers data security and good performance. It is best suited for networks that perform many small I/O transactions at the same time, as well as applications that require data security such as office automation and online customer service. Use it also for applications with high read requests but low write requests.

RAID 5 includes disk striping at the byte level and parity information is written to several hard disk drives. If a hard disk fails the system uses parity stored on each of the other hard disks to recreate all missing information.

RAID 6

RAID 6 is essentially an extension of RAID level 5 which allows for additional fault tolerance by using a second independent distributed parity scheme (dual parity). Data is striped on a block level across a set of drives, just like in RAID 5, and a second set of parity is calculated and written across all the drives; RAID 6 provides for an extremely high data fault tolerance and can sustain two simultaneous drive failures.

This is a perfect solution for mission critical applications.

RAID 10

RAID 10 is implemented as a striped array whose segments are RAID 1 arrays. RAID 10 has the same fault tolerance as RAID level 1. RAID 10 has the same overhead for fault-tolerance as mirroring alone. High I/O rates are achieved by striping RAID 1 segments. Under certain circumstances, RAID 10 array can sustain multiple simultaneous drive failures.

Excellent solution for applications that would have otherwise gone with RAID 1 but need an additional performance boost.

JBOD

Although a concatenation of disks (also called JBOD, or "Just a Bunch of Disks") is not one of the numbered RAID levels, it is a popular method for combining multiple physical disk drives into a single virtual one. As the name implies, disks are merely concatenated together, end to beginning, so they appear to be a single large disk.

As the data on JBOD is not protected, one drive failure could result total data loss.

Stripe Size

The length of the data segments being written across multiple hard disks. Data is written in stripes across the multiple hard disks of a RAID. Since multiple disks are accessed at the same time, disk striping enhances performance. The stripes can vary in size.

Disk Usage

When all 5 disks are of the same size, and used in RAID, 1U4500 disk usage percentage is listed below:

RAID Level	Percentage Used
RAID 0	100%
RAID 1	20%
RAID 5	80%
RAID 6	60%
RAID 10	50%
JBOD	100%

NOTE

RAID 10 allows only 4 disks and one as spare disk.

Appendix D: Active Directory Basics

Overview

With Windows 2000, Microsoft introduced Active Directory (ADS), which is a large database/information store. Prior to Active Directory the Windows OS could not store additional information in its domain database. Active Directory also solved the problem of locating resources; which previously relied on Network Neighborhood, and was slow. Managing users and groups were among other issues Active Directory solved.

What is Active Directory?

Active Directory was built as a scalable, extensible directory service that was designed to meet corporate needs. A repository for storing user information, accounts, passwords, printers, computers, network information and other data, Microsoft calls Active Directory a "namespace" where names can be resolved.

ADS Benefits

ADS lets the 1U4500 integrate itself with the existing ADS in an office environment. This means the 1U4500 is able to recognize your office users and passwords on the ADS server. Other major benefits ADS support provides include:

1. Easy integration of the 1U4500 into the existing office IT infrastructure

The 1U4500 acts as a member of the ADS. This feature significantly lowers the overhead of the system administrator. For example, corporate security policies and user privileges on an ADS server can be enforced automatically on the 1U4500.

2. Centralized user/password database

The 1U4500 does not maintain its own copy of the user/password database. This avoids data inconsistency between the 1U4500 and other servers. For example, without ADS support, an administrator might need to remove a specific user privilege on the 1U4500 and each individual server. With ADS support, the change on an ADS server is known to all of its ADS members.

Appendix E: Licensing Information

Overview

This product included copyrighted third-party software licensed under the terms of GNU General Public License. Please see THE GNU General Public License for extra terms and conditions of this license.

Source Code Availability

Thecus Technology Corp. has exposed the full source code of the GPL licensed software. For more information on how you can obtain our source code, please visit our web site, <http://www.thecus.com>.

Copyrights

- This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).
- This product includes software developed by Mark Murray.
- This product includes software developed by Eric Young (eay@cryptsoft.com).
- This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (<http://www.openssl.org/>).
- This product includes PHP, freely available from (<http://www.php.net/>).
- This product includes software developed by the University of California, Berkeley and its contributors.
- This product includes software developed by Winning Strategies, Inc.
- This product includes software developed by the Apache Group for use in the Apache HTTP server project (<http://www.apache.org/>).
- This product includes software developed by Softweyr LLC, the University of California, Berkeley, and its contributors.
- This product includes software developed by Bodo Moeller.
- This product includes software developed by Greg Roelofs and contributors for the book, "PNG: The Definitive Guide," published by O'Reilly and Associates.
- This product includes software developed by the NetBSD Foundation, Inc. and its contributors.
- This product includes software developed by Yen Yen Lim and North Dakota State University.
- This product includes software developed by the Computer Systems Engineering Group at Lawrence Berkeley Laboratory.
- This product includes software developed by the Kungliga Tekniska Högskolan and its contributors.
- This product includes software developed by the Nick Simicich.
- This product includes software written by Tim Hudson (tjh@cryptsoft.com).
- This product includes software developed by Christopher G. Demetriou for the NetBSD Project.

CGIC License Terms

Basic License

CGIC, copyright 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004 by Thomas Boutell and Boutell.Com, Inc.

Permission is granted to use CGIC in any application, commercial or noncommercial, at no cost. HOWEVER, this copyright paragraph must appear on a "credits" page accessible in the public online and offline documentation of the program. Modified versions of the CGIC library should not be distributed without the attachment of a clear statement regarding the author of the modifications, and this notice may in no case be removed. Modifications may also be submitted to the author for inclusion in the main CGIC distribution.

GNU General Public License

Version 2, June 1991

Copyright © 1989, 1991 Free Software Foundation, Inc.
51 Franklin St, Fifth Floor, Boston, MA 02110-1301 USA

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

PREAMBLE

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program).

Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
 - a) You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
 - b) You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.

- c) If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

- 3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:
 - a) Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
 - b) Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
 - c) Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the

operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.
5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.
6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.
7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

NO WARRANTY

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.
12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

END OF TERMS AND CONDITIONS